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EARTH SCIENCES

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ARCTIC AND ANTARCTIC RESEARCH

SCIENTISTS LEAVE FOR 30TH ANTARCTIC EXPEDITION

Moscow IZVESTIYA in Russian 21 Oct 84 p 1

[Article by A. Muratov]

[Excerpt] On October 21, the first contingent of participants of the 30th Soviet Antarctic Expedition is flying out of Leningrad. The road south begins with a trip to the east: in Vladivostok, the polar scientists will transfer to the motor ship "Baykal".

At the Arctic and Antarctic Scientific Research Institute in Leningrad, D.D. Maksutov, head of the Soviet Antarctic Expedition, answered the phone.

"Dmitriy Dmitriyevich, what is the makeup of the 30th expedition to the Antarctic?"

"There will be 598 scientists and technical personnel. Some of them will stay through the winter, while others will return home with the onset of winter in the southern hemisphere. A second airplane will leave on October 22, also for Vladivostok, and the next day an IL-18D will set out on a flight to Molodezhnaya Station via Odessa, Cairo, Aden, and Maputo.

"Two vessels are being loaded: the diesel-electric ship 'Kapitan Myshevskiy' and the motor ship 'Pavel Korchagin'. This time, a good deal of building material in particular is being taken on board: there are plans to open a new, eighth Soviet station in the Antarctic, with the still tentative name 'Progress'."

"What are the characteristic features of the program of the 30th expedition?"

"Our expedition will complete studies under the program 'Geophysical Survey Area', which was begun several years ago: the network of sensors recording changes in magnetic variations, which extends from Mirnyy more than 1,500 kilometers into the continent's interior, is to be removed. Work is beginning under the program 'Climatic Monitoring', the data of which are essential for predicting changes in the earth's climate. Work at Beaver Lake will expand considerably. A 14-man team, which includes Doctor Hofman, our guest from the German Democratic Republic, will conduct geological and geophysical studies at the temporary summer base 'Soyuz'. Colleagues from France and Cuba will be working in the present Soviet Antarctic Expedition."

EXPEDITION DELIVERS SUPPLIES TO ARCTIC DRIFTING STATIONS

Leningrad LENNINGRADSKAYA PRAVDA in Russian 31 Oct 84 p 1

[Article by O. Rogozina]

[Text] The first AN-26 airplane carrying cargo for the drifting stations "SP-26" and "SP-27" has taken off from Cherskiy.

Other airplanes will soon set out for this point. The high-latitude aerial expedition "Sever-36" has thus begun its work. The main task of this expedition is to provide the polar researchers with everything they need for a long winter stay.

From Cherskiy, polar pilots will deliver foodstuffs to the station, including apples, cabbage, potatoes and carrots, which are so desired in the Arctic. Instruments and equipment needed for the continuation of scientific research in the Central Polar Basin will be replaced with new ones. It is important to deliver all of these things right now, before freezing cold and squall winds create a forbidding barrier on the route to the stations, one of which, "SP-26", is located 1,500 kilometers from the mainland and the other, "SP-27", is 1,000 kilometers away.

FTD/SNAP
CSO: 1865/129

MI-8 HELICOPTER CARGO LOADING EXPERIMENT FOR ARCTIC SHIPPING

Moscow VOZDUSHNYY TRANSPORT in Russian 18 Oct 84 p 4

[OMEL'CHENKO, S., correspondent (Vladivostok and Malaya Kema)]

[Abstract] The article gives an account of a cargo handling experiment in which the ocean-going ship "Lakhta" was loaded and unloaded with the aid of an MI-8 helicopter. The ship was located in the Tatar Strait near Malaya Kema at the time. These operations were carried out by civilian helicopter pilots of Vladivostok, with the participation of specialists of the Far East Marine Shipping Line and the Maritime Territory Timber Procurement Association. It is said that the experiment was performed in connection with work which specialists of the shipping line are doing on the problem of loading and unloading vessels at shore points without cargo handling equipment and in conditions of drifting ice in the Arctic, and in areas without convenient sea inlets, ports and mooring places.

The experiment consisted of two parts: helicopter-aided unloading of fuel and lubricants, and loading of timber. During the first part of the experiment, fuel drums were carried by the helicopter to shore in nets attached to an outside sling. The second part was performed in unusually difficult conditions: packages of logs 2.5-3.0 cubic meters in size had to be lowered into the ship's hold while the helicopter hovered above masts of the vessel that are 25 meters tall. This prevented the aircraft from descending below an altitude of 60 meters above the sea surface.

A number of proposals are made for correcting shortcomings of cargo-handling devices that were used in these operations. They are said to require new slings and suspenders which are more reliable to use. The State Civil Aviation Scientific Research Institute is called upon for assistance in developing high-quality technology for permanent use in such work.

FTD/SNAP
CSO: 1865/129

PLANS FOR ADAPTATION RESEARCH DURING ANTARCTIC EXPEDITION

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 31 Oct 84 p 4

[MKHITARYAN, A.]

[Abstract] The article is an interview with Candidate of Medical Sciences Arkadiy Leonidovich Maksimov, head of the work physiology laboratory of the Kirgiz Academy of Sciences' Institute of the Physiology and Experimental Pathology of High Elevations. It is noted that since 1979, this laboratory has been doing research aimed at studying the human organism's adaptation and forecasting its working fitness in conditions of high elevations, and also at studying human physiological reserves in extreme conditions.

Maksimov is questioned about research that is planned in this connection at the Antarctic station "Vostok" during the 30th Soviet Antarctic Expedition. He mentions members of the expedition who will direct this research: Doctor of Medical Sciences A. A. Aydaraliyev, head of the Physiology Institute's department of applied physiology, and D. Imanaliyev, a science associate of this department. They will be assisted by Ye. Vyaznikovtsev and V. Malygin, physicians of the "Vostok" station.

Maksimov mentions that his laboratory has developed special tests and methods for evaluating and forecasting human performance in high-elevation conditions. Tests conducted during the 25th and 27th Antarctic Expeditions, in which Maksimov took part, reportedly proved the laboratory's methods and forecasts to be 80 percent correct.

During the present Antarctic expedition, Maksimov explains that researchers will test the effectiveness of means of conditioning the organism to endure the oxygen-deficient conditions of "Vostok" station, which is located almost 4,000 meters above sea level. As the participants are en route to the Antarctic by ship, they are doing physiological conditioning exercises such as holding their breath on inhaling or exhaling, and also breathing an oxygen-poor mixture. Maksimov claims that such exercises done over a two-week period can heighten one's resistance to oxygen deficiency by 15-20 percent. The participants also are taking so-called adaptogens based on natural products such as ginseng root, whose effectiveness in increasing resistance to oxygen deficiency will be evaluated.

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UDC: 551.501.721

RESULTS OF COMPARISON OF LONG-WAVE RADIATION FLUXES MEASURED BY SOVIET
AND JAPANESE ACTINOMETRIC RADIOSOUNDS

Moscow IZVESTIYA AKADEMII NAUK SSSR: FIZIKA ATMOSFERY I OKEANA in Russian
Vol 20, No 7, Jul 84 (manuscript received 5 Oct 82; after revision 28 Jul 83)
pp 575-580

DOLGIN, M. I., Arctic and Antarctic Scientific Research Institute

[Abstract] Actinometric radio soundings of the atmosphere were performed between 1966 and 1971 at Antarctic stations of the USSR and Japan. The coordinates of the stations are 67°40' S, 45°50' E and 69°00' S, 39°35' E for the Soviet and Japanese stations. Both stations are in the same climatic region of the Antarctic coast, separated by about 300 km. Cases of simultaneous soundings at both stations, time difference not over 4 hours, during clear skies or complete cloud cover were examined to compare the long-wave radiation measurement values: 22 cases, 11 each clear sky and cloud cover, were involved. Significant differences are found in the measurement results, for which no satisfactory explanation exists. The measurements performed at the Japanese station agree better with predicted values. Figures 2, tables 3; references 18: 16 Russian, 2 Western.

[24-6508]

METEOROLOGY

MEETING OF WORLD METEOROLOGICAL ORGANIZATION IN TASHKENT

Tashkent PRAVDA VOSTOKA in Russian 20 Oct 84 p 1

[Text] A long-range program of work for the United Nations' World Meteorological Organization (WMO), of which more than 150 countries are now members, was adopted at a session of the presidents of technical commissions that ended in Tashkent on October 19. Ways of further deepening and expanding cooperation, maximizing the utilization of meteorological data in various branches of the economy, and improving the performance of hardware for gathering, processing and transmitting information were examined in the course of meetings.

"We discussed such vital problems as changes in our planet's climate and in the ozone layer, and environmental pollution," said Yu. A. Israel', Corresponding Member of the USSR Academy of Sciences, chairman of the USSR State Committee on Hydrometeorology and Monitoring of the Natural Environment, and first vice-president of the World Meteorological Organization. "At the session, it was stressed once again that the working efficiency of meteorological services is based on the free transmission of information to all of the organization's members, without any restrictions. Any member can independently switch on a given channel and receive data of interest to it."

Not by chance was the present meeting held in Tashkent. The capital of Uzbekistan is one of four Soviet centers for the gathering and processing of meteorological information. A large scientific research institute and a space data receiving post have been created here.

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CSO: 1865/129

UDC: 551.510.42:551.58

CLASSIFICATION OF ATMOSPHERIC AEROSOL FOR EVALUATION OF ITS EFFECTS ON CLIMATE

Moscow IZVESTIYA AKADEMII NAUK SSSR: FIZIKA ATMOSFERY I OKEANA in Russian
Vol 20, No 5, May 84 (manuscript received 13 Jan 83) pp 339-348

KONDRAT'YEV, V. Ya. and PROKOF'YEV, M.A., Main Geophysical Observatory

[Abstract] The major areas of active investigation of the climatic effects of aerosol are reported: development of realistic models of aerosol for climate sensitivity studies; comparison of existing models of radiation transfer considering aerosol effects; inclusion of parameterization of radiation transfer in an atmosphere containing aerosol in climatic models; determination of types of global aerosol, necessary for modeling of climate. Constructive superposition of concentration-weighted or optical density-weighted characteristics of various fractions, considering the regional principles of the division of independent sources and generation mechanisms, is the most suitable approach for modeling the vertical structure of optical characteristics of aerosol at the present time. The basic types of aerosols considered in models at the present time are noted. Adequate detailing of atmospheric aerosol models is possible only by utilization of the results of numerical experiments on the sensitivity of climate to aerosol parameters. This requires detailed simulation experiments, the results of which should form the basis of planning for further developments of aerosol models. It is also important to continue efforts for accumulation of data from combined experiments in order to improve models of actual atmospheric aerosol. Figures 1, tables 3; references 56: 18 Russian, 38 Western.

[64-6508]

UDC: 551.509.313

LYAPUNOV STABILITY OF VERY SIMPLE STEADY SOLUTIONS OF PROGNOSTIC SYSTEMS

Moscow IZVESTIYA AKADEMII NAUK SSSR: FIZIKA ATMOSFERY I OKEANA in Russian
Vol 20, No 5, May 84 (manuscript received 3 Jun 82; after revision 6 Dec 82)
pp 356-363

GORDIN, V. A., USSR Hydrometeorological Center

[Abstract] Classes of steady solutions which are stable in the Lyapunov sense are found for three systems used in meteorology and oceanography. This means that the functional phase space contains a steady solution neighborhood such that the trajectories of the system with initial data from this neighborhood always remain within the neighborhood. The work is based on the variational method. Solution of a system of two or three ordinary first-degree differential equations allows Lyapunov-stable smooth solutions to be obtained in circular areas for the systems studied. The systems studied include: a system of shallow water equations considering rotation in polar coordinates; a shallow water system considering friction with the bottom; and a barotropic model of the atmosphere. References 25: 19 Russian, 6 Western.

[64-6508]

UDC: 551.513.2

POSSIBLE MULTIPLE ATMOSPHERIC THERMAL MODES WITH TIME SCALE ON ORDER OF ONE MONTH

Moscow IZVESTIYA AKADEMII NAUK SSSR: FIZIKA ATMOSFERY I OKEANA in Russian
Vol 20, No 6, Jun 84 (manuscript received 24 Mar 83; after revision 25 Oct 83)
pp 456-468

PETUKHOV, V.K., Atmospheric Physics Institute, USSR Academy of Sciences

[Abstract] A study is made of certain natural atmospheric conditions with characteristic times much greater than the dynamic time, which is a few days. The presence of a minimum in the spectrum of major atmospheric variables such as temperature with a period of 15 to 20 days, comparable in depth with the mesometeorological minimum, allows processes with the new time scales to be distinguished. The model analyzes a spherical layer of the atmosphere over an underlying layer with properties symmetrical relative to the equator. Equal areas of ocean and continent (four in all) are assumed to alternate along each parallel, reproducing the global structure of the northern hemisphere. The physical properties of the continental and ocean surfaces are considered independent of coordinates except for a jump at the snow line or polar ice line. It is assumed that the time scale of the processes studied is significantly less than the scale of forced seasonal changes caused by the annual variation of insolation and properties of the underlying surface. Multiple stable quasi-steady thermal modes are observed when certain parameters are used. Figure 1; references 28: 19 Russian, 9 Western.

[15-6508]

UDC: 551.465.7:551.515.2

INFLUENCE OF INTERACTION BETWEEN OCEAN AND ATMOSPHERE ON INTENSITY OF
MOVING TROPICAL CYCLONE

Moscow IZVESTIYA AKADEMII NAUK SSSR: FIZIKA ATMOSFERY I OKEANA in Russian
Vol 20, No 9, Sep 84 (manuscript received 26 Jan 83) pp 787-794

SUTYRIN, G. G. and KHAIN, A.P., Oceanology Institute, USSR Academy of
Sciences; USSR Hydrometeorological Center

[Abstract] Results are presented from numerical experiments of the interaction of a tropical cyclone with the upper layer of the ocean for various speeds of movement of the cyclone and thicknesses of the mixing layer of the ocean. The calculations were performed with an axisymmetrical 12-level tropical cyclone model and an integral model of the upper layer of the ocean. Changes in the water surface temperature were considered in the model by the use of values obtained by averaging the temperature of the mixing layer over the area of the ring around the eye of the storm. The speed of movement and undisturbed thickness of mixing layer were varied in the experiments. The experiments show a significant influence of negative feedback between the cyclone and the ocean on the intensity of the moving storm. As the speed of movement and initial thickness of mixing layer decrease, consideration of the interaction of the ocean and the atmosphere leads to greater weakening of the storm. The characteristic time of transition to a new quasisteady state is several days. The results indicate that actual prediction of the behavior of a storm is impossible without accurate consideration of the interaction between the ocean and the atmosphere. Figures 3, tables 1; references 27: 11 Russian, 16 Western.

[95-6508]

OCEANOGRAPHY

RESULTS OF STUDIES BY SUBMERSIBLES AND DIVERS IN ATLANTIC

Moscow PRAVDA in Russian 12 Oct 84 p 4

[Article by A. Androshin]

[Excerpt] The scientific research ship "Rift" has received a warm welcome in the port of Novorossiysk. A large-scale geological-geophysical expedition of Soviet oceanologists had come to an end. As a result of it, scientists have broadened substantially knowledge about underwater mountains of the Mediterranean Sea and the Eastern Atlantic. Studies of their summits were carried out for the first time with the aid of divers and different types of modern technical equipment. The "Rift" was an indispensable helper of another research ship, the "Vityaz'", which returned home a little bit earlier.

Materials which the scientists brought back to laboratories testify to the effectiveness of the new technical equipment for underwater studies. For example, there is a drawing which shows the true appearance of the famous mountain Ampere, which is located deep in the Atlantic, west of Gibraltar. Its three-dimensional portrait was drawn by a computer which specialists of a mathematical processing team programmed with data of geomorphological and geomagnetic surveys. The researchers obtained three-dimensional pictures of this type in other survey areas as well.

Good work also was done by the unmanned, towed submersible craft "Zvuk", which was developed at the USSR Academy of Sciences' Oceanology Institute. With it, members of the expedition spent hours viewing underwater objects on the screen of a TV set on the ship. In addition, this craft was equipped with a camera which shot 8,000 frames in the course of the expedition. One of them shows a detailed fragment of Ampere's 'stone masonry.' This picture was taken at a depth of 80 meters. It should be noted that researchers are working on new craft of this type. In addition to operating at deep levels, they will also be able to take samples from the sea bottom.

One more photograph is of interest. It shows diver Nikolay Levchenko on a platform of the diving bell, standing watch for comrades who were off in search of samples. The location was on Mount Ampere, at a depth of 105 meters. The picture was taken by diver Valeriy Antipov using a new deep-water divers' photographic system which was developed at the Southern Branch of the Oceanology Institute, and which also passed its first trials in the ocean's depths.

(The drawing of Ampere and the two photographs described in the text accompanied the article.)

RESEARCH SHIP 'MUL'TANOVSKIY' SAILS FOR NORWEGIAN SEA

Leningrad LENINGRADSKAYA PRAVDA in Russian 17 Oct 84 p 4

[Article by O. Rogozin]

[Text] Large-scale studies within the framework of the USSR's national program "Razrezy" (Cross-Sections) and the project "POLEKS--Sever" (Polex--North) are continuing. Today the scientific research ship "Professor Mul'tanovskiy" is setting out on another cruise.

For two months the crew will conduct a number of meteorological, oceanographic studies in the vicinity of the Norwegian Energy-Active Zone.

A great deal of work awaits the synoptic group: the North Atlantic long has been known for its severe storms. They are spawned here, in the Faroe-Shetland Strait in the North Sea. Their force sometimes reaches 10-12 points. And even modern heavy cargo vessels avoid encounters with such storms.

In the course of the expedition the crew will carry out a complex of standard meteorological observations and compile daily weather forecasts and storm warnings for shipping regions.

FTD/SNAP
CSO: 1865/129

WORK ON SONAR INSTRUMENTS FOR OCEANOGRAPHY

Moscow LENINSKOYE ZNAMYA in Russian 21 Oct 84 p 4

[Article by A. Kolodin, engineer of the All-Union Scientific Research Institute of Physical-Technical and Radio Measurements (Solnechnogorsk Rayon)]

[Excerpts] For most of us, the sea means recreation, resorts and seagulls. But for scientists of the All-Union Scientific Research Institute of Physical-Technical and Radio Measurements (VNIIIFTRI), it means hard and painstaking work. They (literally) measure the sea.

Instruments developed in VNIIIFTRI laboratories make it possible to measure such things as temperature fluctuations with a precision as high as thousandths of a degree, and also such things as the speed of sound, electric conductivity, and concentrations of impurities. But how does one go about constructing a general picture on the basis of these properties, which differ in character and physical nature? What can temperature and the speed of sound have in common, for example? It is difficult to correlate these parameters, and therefore the processing of information that is obtained takes too much time, even with the aid of a computer. The only solution is to develop devices which would allow simultaneous measurement of these properties. And VNIIIFTRI scientists have succeeded in developing such devices.

Measurements in the ocean that are both more and more accurate and far-reaching are making it possible to solve a number of ecological and biological problems. Towed scanning sonar apparatus has been developed in institute laboratories for this purpose. These instruments are capable of registering individual specimens as small in size as a centimeter near the ocean surface.

In designing the new marine sonar apparatus, the scientists have encountered an unforeseen difficulty, to be sure. On the other hand, the use of high ultrasonic frequencies is desirable if the instrument is to perform more effectively. But when the frequency is increased, the absorption of sound in the water increases because of the large amount of air bubbles in the surface layer of the sea. Determining the so-called sound attenuation coefficient is therefore one of the most immediate tasks of VNIIIFTRI associates.

FTD/SNAP
CSO: 1865/129

POLAND BUILDING VESSELS FOR SOVIET OFFSHORE DRILLING PROGRAM

Moscow EKONOMICHESKAYA GAZETA in Russian Oct 84 No 44 p 21

[Article by A. Babenko]

[Text] The banner of the Soviet Union has been raised over a multipurpose tug, the "Neftegaz-11", which was built to Soviet orders at the Warski Shipyard in Szczecin. This new vessel is intended for servicing offshore drilling platforms and conducting prospecting work in the zone of the continental shelf.

The personnel of this shipyard and specialists of the All-Union "Sudoimport" (ship importing) Association have a long tradition of cooperation. Soviet orders are furthering the rapid development of the republic's shipbuilding, are largely determining the general directions of planning-and-design and research work, and are making it possible to introduce more sophisticated vessels into production. Graphic evidence of this was provided by the signing in Moscow on October 10 of a new contract which calls for the delivery of another 25 vessels to the USSR within the framework of a program called "Shel'f".

As the newspaper "Trybuna Ludu" has noted, the signing of this document was an important event in the country's economic life. It reconfirmed the fact that the Soviet Union is a major long-term client of Poland.

FTD/SNAP
CSO: 1865/129

FINNISH-BUILT OCEANOGRAPHIC SHIP 'AKADEMIK LAVRENT'YEV'

Riga SOVETSKAYA LATVIYA in Russian 1 Nov 84 p 4

[Text] A new floating institute, the motor ship "Akademik M. A. Lavrent'yev", has been moored at a pier of the [Riga] port terminal. This vessel, which bears the name of an outstanding Soviet scientist, has been built to orders of the Soviet Union at a shipyard in the Finnish city of Rauma. It belongs to the USSR Academy of Sciences' Far East Research Center. It is the most modern Soviet ship intended for comprehensive studies of the world's oceans.

"Laboratories, testing units and complexes outfitted with the latest instruments have been equipped on board the motor ship," said B. Laptev, the ship's captain. "All data will flow into an integrated-research complex equipped with two computers, which process information as it is obtained. On its first research cruise, the floating institute 'Akademik M. A. Lavrent'yev' will sail from Riga to the Atlantic and Indian Oceans, and it will complete the cruise in Vladivostok in February of next year."

(A photograph was given showing the "Akademik M. A. Lavrent'yev" in port.)

FTD/SNAP
CSO: 1865/129

UDC: 551.466.3

EXPERIMENTAL DATA ON INTEGRAL CHARACTERISTICS OF WIND WAVES

Moscow IZVESTIYA AKADEMII NAUK SSSR: FIZIKA ATMOSFERY I OKEANA in Russian
Vol 20, No 5, May 84 (manuscript received 22 Jul 82) pp 405-411

ZHURBAS, V. M., ZASLAVSKIY, M. M. and LOBYSHEVA, L. G., Oceanology Institute,
USSR Academy of Sciences

[Abstract] Results of measurement of both wind and waves off the Bulgarian
Black Sea coast during the international "Kamchiya-79" experiment are used to
provide a detailed idea of the variation of integral wind wave characteristics
as functions of degree of wave development. Characteristics studied include
momentum, energy, characteristic slope and steepness. As waves develop,
action increases most rapidly, momentum least rapidly, effective slope
decreases and their narrow-band parameter increases. Figures 4, references 15:
9 Russian, 6 Western.

[64-6508]

UDC: 551.465.11:551.465.15

CALCULATION OF TRAJECTORIES OF PARTICLES IN SYNOPTIC EDDY MODEL

Moscow IZVESTIYA AKADEMII NAUK SSSR: FIZIKA ATMOSFERY I OKEANA in Russian
Vol 20, No 5, May 84 (manuscript received 29 Nov 82; after revision 23 May 83)
pp 412-421

SEIDOV, D. G. and MARUSHKEVICH, A. D., Oceanology Institute, USSR Academy of
Sciences

[Abstract] A study is made of the motion of water particles in a field of
synoptic eddies in a model of two-dimensional barotropic synoptic open ocean
eddies with simplified boundary conditions. The effect of wind on the surface
of the ocean was ignored, as was the jet stream. It is found that in the
open ocean with weak large-scale background, water characteristics and
processes of main water mass transfer should be determined by advection
through synoptic eddies. Figures 7; references 11: 7 Russian, 4 Western.
[64-6508]

UDC: 551.524.2:551.465.63:551.466.2:
551.521.2:535.51

DETERMINATION OF TEMPERATURE AND DEGREE OF ROUGHNESS OF SEA AND LAND SURFACES
BY MICROWAVE RADIOMETRIC POLARIZATION MEASUREMENTS

Moscow IZVESTIYA AKADEMII NAUK SSSR: FIZIKA ATMOSFERY I OKEANA in Russian
Vol 20, No 5, May 84 (manuscript received 9 Dec 82; after revision 21 Mar 83)
pp 431-437

BOGORODSKIY, V. V., KOZLOV, A. I. and SHESTOPALOV, Yu. K., Arctic and
Antarctic Scientific Research Institute; Moscow Institute of Civil Aviation
Engineers; Omsk Institute of Railroad Transport Engineers

[Abstract] Remote radiophysical methods are widely used to study natural surfaces, deriving information on temperature, dielectric constant and configuration of surfaces. The influence of roughness of both sea and land surfaces on the intensity of radiothermal radiation can be determined by polarization measurements which carry information on the roughness of surfaces. The roughness parameters $a^2 = 4\sigma^2/\lambda^2$ and $r^2 = 4\pi\sigma^2/(\lambda\sqrt{1+2\lambda/\lambda})$ are introduced, where σ is the standard deviation of surface roughness, λ is the spatial correlation radius of roughness and λ is wavelength. A surface roughness criterion is introduced which is based on the integral influence of roughness on electromagnetic radiation. The problem of determining the temperature of the earth's surface on the basis of polarization radiometric measurements is analyzed.
Figures 5; references: 6 Russian.

[64-6508]

UDC: 551.466.2

DETERMINATION OF GRAVITY WAVE ENVELOPE SOLITONS ON SURFACE OF STRATIFIED
FLUID INTERACTING WITH WIND

Moscow IZVESTIYA AKADEMII NAUK SSSR: FIZIKA ATMOSFERY I OKEANA in Russian
Vol 20, No 5, May 84 (manuscript received 29 Jan 82; after revision 26 Jan 83)
pp 438-440

PETROV, V. V., Gor'kiy State University

[Abstract] Instability can generate nonlinear steady movements of a fluid in the form of an envelope soliton accompanied by a nonlinearly induced internal wave soliton. This work is dedicated to a detailed analysis of these waves, considering the nonconservative nature of the medium and the wind effect. The work is based on a shortened equation system from a previous work with the addition of terms describing dissipation and the wind effect. Numerical estimates of the parameters of the steady mode found are presented.
References: 7 Russian.

[64-6508]

UDC: 550.372

ELECTROMAGNETIC FIELD OF CURRENTS AND ITS USE TO ESTIMATE TOTAL CONDUCTIVITY OF SEDIMENTARY DEPOSITS IN WESTERN BLACK SEA

Moscow IZVESTIYA AKADEMII NAUK SSSR: FIZIKA ZEMLI in Russian No 6, Jun 84
(manuscript received 19 Aug 82) pp 86-94

KOROTAYEV, S.M., SHABELYANSKIY, S.V., TROFIMOV, I.L., ABRAMOV, Yu.M.,
KUTKIN, V.V., GAYDASH, S.P. and ABRAMOVA, L.M., Terrestrial Magnetism,
Ionosphere and Radio Wave Propagation Institute, USSR Academy of Sciences

[Abstract] In July-October of 1981, the author's institute and the computer center, Siberian Department, USSR Academy of Sciences undertook a combined geophysical expedition to the Bulgarian shelf region and adjacent continental slope in order to study the deep structure of the sedimentary cover and basement. Electromagnetic measurements were undertaken to solve the problems of marine magnetotelluric soundings, magnetic variation profiling and magnetohydrodynamic profiling. Fields induced by currents in the sea were given particular attention both in the organization of measurements and in processing of data obtained. The electromagnetic field of the currents was measured over a broad range of time periods, from three hours to four days. The greatest amplitudes were observed over synoptic periods, up to 4 \AA in the magnetic components, about $10 \mu\text{V}\cdot\text{m}^{-1}$ in the electrical components. The total longitudinal conductivities were determined by two methods, and the data coincide with measurements by several other methods and with seismic and gravimetric data on sediment thickness. The combination of deep marine magnetotelluric soundings with measurements of velocity variations will allow not only production of independent estimates of S , but also qualitative consideration of the interference introduced by the presence of currents. Figures 2; references 13: 12 Russian, 1 Western.

[14-6508]

UDC: 551.24

ABSOLUTE MOVEMENT OF PACIFIC OCEAN PLATE BASED ON PALEOCLIMATIC AND PALEOMAGNETIC DATA AND TRAJECTORY OF HOT SPOTS DURING LAST 120 MILLION YEARS

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 276, No 6, Jun 84 (manuscript received 28 Nov 83) pp 1442-1445

KONONOV, M. V., Oceanology Institute imeni P. P. Shirshov, USSR Academy of Sciences, Moscow

[Abstract] Climatic zonality in the open ocean influences the nature of sediment accumulation. The area of high productivity within 10° of the equator is an area of greatly increased carbonate sedimentation. Analysis of materials from deep water drilling in the northwest Pacific and published information on the time when parts of the Pacific plate passed the equator were used to

determine the positions of equatorial high productivity zones in the past. According to these data, 100 million years ago the central Pacific plate was 36° further south than at present. The mean rate of latitude drift of the plate has been 4 centimeters per year. Paleomagnetic poles indicate movement of the Pacific plate to the north by more than 5000 km over the past 120 million years. The most reliable paleomagnetic poles were selected by comparing paleomagnetic and paleoclimatic data, obtaining a trajectory of apparent migration of the paleomagnetic poles. These data indicate movement of the Pacific plate northward by 42° over 120 million years, 24° over the past 80 million years. The actual movement should be greater due to the longitudinal component in the displacement vector. A map is presented of movements of the North Pole relative to the Pacific plate, based on hot spot trajectories. The data obtained from these three independent sources unambiguously indicate movement of the Pacific plate over the past 120 million years by approximately 9000 km toward the northwest. Figures 2, tables 2; references 10: 1 Russian, 9 Western.

[7-6508]

UDC: 535.417(008.8)

ONE PHYSICAL MECHANISM OF FORMATION OF FINE STRUCTURE OF OCEAN WATERS

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 276, No 6, Jun 84 (manuscript received 3 Feb 84) pp 1464-1466

KUDIN, A. M. and ABRAMYAN, T. O., Oceanology Institute imeni P. P. Shirshov, USSR Academy of Sciences, Moscow

[Abstract] Results from studies of the intrusion mechanism of formation of the fine structure of waters in the ocean are presented in universal form. Using expressions from a previous work for the propagation of the leading edge of an individual cylindrical intrusion $L(t)$ and its maximum thickness $h(t)$, the authors obtain $M = (Nt)^{-1/3}$, where $M = Ah/L$; $A = 0.48(NS/\nu)^{1/3}$, N is the Vaisala-Brunt frequency, S is the cross-sectional area of the cylindrical spot which is constant in the viscous stage, ν is the kinematic viscosity of the fluid in the spot. Nineteen experiments in a tank measuring $50 \times 375 \times 190$ mm and 6 experiments in a tank twice this size demonstrate the universality of the expression for density heterogeneities formed due to the interaction of cylindrical spots in a mixed fluid. Figures 3; references: 7 Russian.

[7-6508]

UDC: 551.63

DYNAMIC STOCHASTIC MODEL OF LONG-PERIOD VARIABILITY OF OCEAN SURFACE TEMPERATURE

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 276, No 6, Jun 84 (manuscript received 2 Jan 84) pp 1467-1470

PITERBARG, L. I. and OSTROVSKIY, A. G., Oceanology Institute imeni P. P. Shirshov, USSR Academy of Sciences, Moscow

[Abstract] A correlation is established between an evolutionary discrete stochastic system and a first-order multivariate autoregression model. This result solves the important methodological problem of providing a basis for statistical models of large-scale geophysical processes and allows estimates of autoregression parameters to be used to calculate the unknown parameters of the equations. The approach is used in analysis of long-period variability of the water surface temperature in the North Atlantic. The autoregression model is constructed on the basis of the concept of Hasselmann stochastic climate models. The method suggested is an opposite to and a supplement to numerical modeling. In numerical modeling, coefficients of equations and the initial field are assigned as the input and the temperature field is produced as the output. In the suggested method the input field is set and the coefficients and other known parameters of the equations are produced as the results. Figure 1, references 4: 2 Russian, 2 Western.

[7-6508]

UDC: 551.466.71(265.5)

TWO-CYCLE MECHANISM OF DISSIPATION OF TIDAL ENERGY IN OCEAN

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 276, No 6, Jun 84 (manuscript received 22 Feb 84) pp 1470-1473

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[Abstract] Studies of recent years have shown that a special type of geostrophic movement, the continental shelf wave, is important in the formation of daily tides in the high latitudes. Estimates are presented of the dissipation of continental shelf waves in the example of the North Pacific Ocean. Studies have indicated that the shelf component of the tides should be intensively dissipated. It is found that in the high latitudes a two-cycle mechanism of tidal energy dissipation indicates for the daily tides: 1) transition of energy from large-scale inertial-gravitational waves to small-scale geostrophic waves, converting a portion of the potential energy of tidal movements to kinetic energy; and 2) dissipation of the geostrophic shelf waves by bottom friction. Shelf waves dissipate a significant portion of tidal energy in this manner. Figures 1, references 15: 11 Russian, 4 Western.

[7-6508]

UDC: 551.46:661.729

DISTRIBUTION OF ORGANIC PEROXIDES IN SURFACE WATERS OF SOME OCEAN REGIONS

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 276, No 6, Jun 84 (manuscript received 19 Dec 83) pp 1474-1476

SOKOLOV, Ye. A., MISHUKOV, V. F. and ANIKIYEV, V. V., Pacific Ocean Oceanological Institute, Far Eastern Scientific Center, USSR Academy of Sciences, Vladivostok

[Abstract] During the first cruises of the research vessel "Akademik Aleksandr Nesmeyanov," May-Aug 1982, observations of the distribution of organic peroxides in the surface microlayer and surface horizon of sea water were conducted in the Atlantic and Indian Oceans, as well as the Mediterranean, Red and South China Seas. Surface horizon specimens were taken in glass bottles at about 15 cm depth, microlayer specimens were taken by a net type sampler with an area of about 1/2 square meter from the top 0.3 mm layer of the water from a small boat about one nautical mile upwind from the ship. Organic peroxides were found at concentrations 1 to 2 orders of magnitude lower than in river and lake water. Concentrations were highest in the surface microlayer. The results indicated intensive oxidation of organic matter in sea water. Tables 1; references 5: 3 Russian, 2 Western.

[7-6508]

UDC: 551.351

SOME SPECIFICS OF LITHODYNAMIC PROCESSES IN LITTORAL ZONE AND THEIR PREDICTION

Leningrad VESTNIK LENINGRADSKOGO UNIVERSITETA: GEOLOGIYA, GEOGRAFIYA in Russian No 12, Issue 3, Jun 84 (manuscript received 26 Sep 83) pp 24-34

LOGVINENKO, N. V., BARKOV, L.K. and MATVEYEV, Ye. A.

[Abstract] A study is made of some of the specifics of lithodynamic processes in the littoral shelf zone and their prediction, based on multiannual studies in tidal estuaries and tidal seas with underwater sandbars. Theoretical conclusions are developed on the basis of a unified systems approach to the process of interaction of the wave and tidal energy field with the underwater slope. A quantitative estimate and qualitative analysis of these processes are produced by statistical processing by electronic computer. It is found that a storm may not only move sandbars, but also result in production of an entirely set of sandbars, with the outermost bar disappearing or a new outermost bar appearing, changes in the number, location and angle of bars. This means that the concepts of "bar number" and "number of bars" are relative and temporary. Figures 4; references 13: 11 Russian, 2 Western.

[10-6508]

UDC: 550.843:551.46.08

MEASUREMENT OF pH OF SEA WATER UNDER NATURAL CONDITIONS BY POTENTIOMETRIC SOUNDING

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 277, No 1, Jul 84 (manuscript received 10 Jan 84) pp 204-206

ZOTOV, A. V., KRYUKOV, P.A., MALOV, V. S., OBZHIROV, A. I. and PRIKHOD'KO, V.A., Geology of Ore Deposits, Petrography, Mineralogy and Geochemistry Institute, USSR Academy of Sciences, Moscow; Inorganic Chemistry Institute, Siberian Department, USSR Academy of Sciences, Novosibirsk; Pacific Ocean Oceanological Institute, Far Eastern Scientific Center, USSR Academy of Sciences, Vladivostok; Experimental Mineralogy Institute, USSR Academy of Sciences, Chernogolovka, Moscow Oblast

[Abstract] Measurements of pH at high pressures with a glass electrode were performed by compensating the pressure on both sides of the glass membrane during the 8th cruise of the research vessel "Dmitriy Mendeleev." This article presents results of pH measurement during the 2d voyage of the "Akademik Nesmeyanov" at depths of up to 2.2 km. Measurements were performed by two potentiometric systems differing slightly in design. Both systems are remote multichannel devices consisting of a probe lowered into the sea on a single-core cable and an on-board recording instrument. Signals are transmitted through 14 and 6 channels by the two devices. A graph illustrates the temperature and pH of sea water as a function of depth. The use of potentiometric probes equipped with ion-selective glass electrodes is said to be a promising trend in chemical oceanography, particularly valuable for in situ determination of nonconservative parameters of sea water. Figures 1, references 8: 5 Russian, 3 Western.

[13-6508]

UDC: 551.465.7:551.464.34

INFLUENCE OF BUBBLES FORMED UPON BREAKING OF WAVES ON GAS EXCHANGE BETWEEN OCEAN AND ATMOSPHERE

Moscow IZVESTIYA AKADEMII NAUK SSSR: FIZIKA ATMOSFERY I OKEANA in Russian Vol 20, No 7, Jul 84 (manuscript received 5 Jul 83; after revision 24 Oct 83) pp 606-613

ALEKSEYEV, V. V. and KOKORIN, A. O., Moscow State University

[Abstract] A study was made of bubble gas exchange in storm zones in the ocean. A numerical model is presented allowing calculation of the gas flow from the bubbles into the water under various hydrodynamic conditions. Construction of a model requires the use of various parametric equations and simplifying assumptions. For this reason, a laboratory experiment was first performed, results of which were used to test the model, determine the limit

of applicability of the assumption of proportionality of gas flow from a bubble to the area of its surface. It was found that the use of parametric equations leads to good agreement of the calculated flow and experimental data. The calculation indicated that at wind speeds of 12 to 16 m/s, the contribution of bubbles to gas exchange between the ocean and the atmosphere increases greatly. At very high wind speeds, 20 m/s or more, breaking of waves and introduction of large numbers of air bubbles into the upper layers of the ocean should lead to a sharp decrease in the time required to establish identical concentrations of gases in the upper layer of the ocean and the lower layer of the atmosphere. Figures 4, references 20: 11 Russian, 9 Western.

[24-6508]

UDC: 551.557.33

CONSIDERING ZONAL WIND IN SEMIDIURNAL TIDE PROBLEM

Moscow IZVESTIYA AKADEMII NAUK SSSR: FIZIKA ATMOSFERY I OKEANA in Russian
Vol 20, No 10, Oct 84 (manuscript received 4 Apr 83) pp 907-914

KAYDALOV, O. V., Experimental Meteorology Institute

[Abstract] An analysis is presented of theoretical models of the semidiurnal atmospheric tide from the standpoint of correctness of consideration of the zonal wind. Results of numerical modeling of the semidiurnal tide using a numerical model of atmospheric oscillations are also discussed. The analysis determines the degree of accuracy of consideration of zonal wind by the various models which are studied and yields practical recommendations for their application. The equation for averaging zonal wind in the modified theory of semidiurnal atmospheric tides is quite general, allowing correct application of the modified theory in the solution of other problems, while the criterion for application of the theory of disturbances for consideration of zonal wind is easily extended to any type of atmospheric oscillation such as internal gravity waves. The results of numerical modeling indicate that the zonal wind is not the basic cause of seasonal changes in atmospheric tide characteristics, and its short-period variations cannot cause strong intra-seasonal variability as is observed in the semidiurnal tide in the lower thermosphere. A numerical model of the semidiurnal tide utilizing modern computers can quite accurately calculate the tide characteristics. However, due to the lack of an empirical semidiurnal tide model for altitudes of 80 - 100 km, many theoretical results are prevented from being of value in the solution of the most important problems relating to investigation of the tides. Figures 2; references 17: 10 Russian, 7 Western.

[155-6508]

UDC: 551.466.3:551.461.2

LOW-FREQUENCY OSCILLATIONS OF SEA LEVEL AND GROUP STRUCTURE OF WIND WAVES

Moscow IZVESTIYA AKADEMII NAUK SSSR: FIZIKA ATMOSFERY I OKEANA in Russian
Vol 20, No 10, Oct 84 (manuscript received 3 Feb 83) pp 985-994

YEFIMOV, V.V. and SOLOV'YEV, Yu.P., Marine Hydrophysics Institute, Ukrainian
Academy of Sciences

[Abstract] String-type resistance wave measuring devices were used to measure low-frequency sea level oscillations and group wind wave structures on a stationary installation in the Black Sea over 40 km from the nearest shoreline in an area with a smooth and level bottom and a mean depth of 30 m. The wavemeter signal was first passed through a low-pass filter with a time constant of about 15 seconds, then sent to a recorder simultaneously with the unfiltered signal to allow synchronous recording of oscillations of surface level at the wind wave frequency and at lower frequencies. Wind velocity and direction at a height of 70 m were also continuously recorded. Estimates of spectral wind wave parameters based on five-minute sequences of measurements differ significantly due to the group structure of the waves. Low-frequency oscillations generated by groups of waves were observed in the wind wave field. The nature of the low-frequency oscillations was physically related to the development of low-frequency oscillations of current velocity in the surface layer. Velocity variations can be explained within the framework of a model of viscous nonpotential movement generated by wind waves. Figures 5, tables 1; references 12: 5 Russian, 7 Western.

[155-6508]

UDC: 551.466.62

EXPERIMENTAL STUDY OF RUN-UP OF SOLITON-TYPE WAVES ONTO FLAT SLOPING BEACHES

Moscow IZVESTIYA AKADEMII NAUK SSSR: FIZIKA ATMOSFERY I OKEANA in Russian
Vol 20, No 6, Jun 84 (manuscript received 17 Jan 83) pp 520-525

KONONKOVA, G.Ye. and POKAZEYEV, K.V., Moscow State University

[Abstract] The purposes of this work were to establish the variation in splash height and wave height at the water line as functions of initial values of height and length of a wave, its shape, water depth and slope angle of the beach over a broad range of such angles and to determine the variation in splash height as a function of wave height at the water line. Experiments were performed in a glass trough 7 meters in length, 20 cm wide and 40 cm deep. A wave generator was placed at one end, a flat slope simulating a beach at the other end. Four different wave generators were used to create soliton-type waves. The first three were rectangles 22, 60 and 108 cm in length which were immersed suddenly into the water. Wave generator No 4 was a cylindrical body 11 cm in diameter with an axis perpendicular to the length

of the trough. The relative splash height reaches a maximum of between 2.5 and 5, and is proportional to the square root of the parameter Π , which was defined in a previous work. The Π value for which the relative splash height is maximal corresponds to the upper boundary of nonbreaking waves. The variation in relative wave height at the water line as a function of Π also has a maximum which is in the same area where the ratio of splash height to wave height has its minimum. Figures 4; references 16: 10 Russian, 6 Western.

[15-6508]

UDC: 551.465.75

ENERGY STRUCTURE OF ATMOSPHERIC BOUNDARY LAYER ABOVE WAVES

Moscow IZVESTIYA AKADEMII NAUK SSSR: FIZIKA ATMOSFERY I OKEANA in Russian Vol 20, No 9, Sep 84 (manuscript received 4 Jan 83) pp 834-841

PANCHENKO, Ye. G. and CHALIKOV, D. V., Oceanology Institute, USSR Academy of Sciences

[Abstract] Movements in the atmospheric layer just above the water can be divided into three groups: quasihorizontal motions, wave motions created by the influence of the curved and moving surface of the water, and turbulent motions generated by the mean and wave velocity field. Formal derivation of energy equations for these three types of motion is undertaken in a tracking system of coordinates in which height is calculated from the moving surface. Equations for the evolution of kinetic energy of all three components are derived. The results of this study can serve as a basis for constructing a univariate differential model of the boundary layer above the surface of the waves. The specifics of the model yield a new variable, the energy of wave motions, for which a special equation must be constructed. Figures 4, references: 1 Russian.

[95-6508]

UDC: 551.465.72

STRUCTURE OF COLD FILM IN WATER-AIR BOUNDARY LAYER

Moscow IZVESTIYA AKADEMII NAUK SSSR: FIZIKA ATMOSFERY I OKEANA in Russian Vol 20, No 9, Sep 84 (manuscript received 30 Mar 83) pp 848-853

ANISIMOVA, Ye. P., BELOV, Yu. N. and SPERANSKAYA, A. A., Moscow State University

[Abstract] A study is made of the distribution of temperature in the water-air boundary layer with little temperature difference between the water and the air and with no adequate transfer. Experiments were performed under laboratory

conditions on an installation consisting of a 25-liter plastic bath insulated on the bottom and sides by plastic foam 50 mm thick. A thermocouple measured the temperatures of air and water. The working junction had a diameter of 100 μm and a time constant of 0.050 s in air, 0.005 s in water. Oscillographic tapes show the temperature and allow determination of the point of entry of the thermocouple into the water with an accuracy of $\pm 60 \mu\text{m}$. The experiments show that when the water is much warmer than the air (15 to 20°C) all components of the thermal balance are directed from water to air. If the air temperature is a few degrees higher than the water temperature, the contact heat flux into the atmosphere may be greater than the heat loss of evaporation and effective radiation, and the heat flux into the water may be directed from the division boundary toward the lower layers of the water. A warm film is formed in this case on the water surface. In intermediate situations, with air and water temperature difference not over 1-1.5°C, cold films are present in the surface layer of the water and in a thin air layer near the water surface. Figures 3, references 12: 11 Russian, 1 Western.
[95-6508]

UDC: 551.466.3

HIGH-FREQUENCY WIND WAVE SPECTRUM IN STORM BASIN

Moscow IZVESTIYA AKADEMII NAUK SSSR: FIZIKA ATMOSFERY I OKEANA in Russian
Vol 20, No 9, Sep 84 (manuscript received 5 Dec 82; after revision 12 Dec 83)
pp 861-866

LEYKIN, I. A., Oceanology Institute, USSR Academy of Sciences

[Abstract] Results are presented from measurements of the spectrum of developing wind waves in a circular aerohydrochannel under realistic conditions. The variation of the high-frequency (up to 10 Hz) portion of the spectrum as a function of wave formation conditions and long wave parameters is discussed. Measurements were performed in the storm basin of the Marine Hydrophysics Institute, Ukrainian Academy of Sciences, a circular channel 40 m in diameter with a rectangular cross section of 2 x 5 m, water depth 2.4 m using a nichrome resistance depth sensor with 1 mm resolution. The frequency energy spectrum was calculated by computer with separate analysis of the low-frequency (0-2.5 Hz) and high-frequency (0-10 Hz) portions of the spectrum. The experimental data indicate absence of an equilibrium interval in the HF portion of the spectrum of wind waves. Figures 4, tables 2; references 10: 6 Russian, 4 Western.
[95-6508]

UDC 551.465(265)

FRONTAL NATURE OF CROMWELL CURRENT

Moscow OKEANOLOGIYA in Russian Vol 24, No 5, Sep-Oct 84 (manuscript received 1 Mar 83, after revision 16 May 83) pp 725-731

PAKA, V. T. and FEDOROV, K. N., Oceanology Institute imeni P. P. Shirshov, USSR Academy of Sciences, Moscow

[Abstract] A study of kinematic and dynamic parameters indicates that the Cromwell Current, at least along a considerable part of its length, has a clearly expressed frontal nature. There is convergence of the meridional velocity component within the current, divergence in the layer adjacent to the surface and a considerable horizontal salinity gradient in a meridional direction in a narrow zone extending along the equator within the current. The Cromwell Current is associated with the longest (and in position, most stable) subsurface salinity front in the ocean, this distinguishing it from the Lomonosov Current in the Atlantic Ocean and the Tareyev Current in the Pacific Ocean. This salinity gradient is what gives such a well-expressed frontal nature to the Cromwell Current and as a result the transequatorial transport is also transfrontal. As a result, the current has a highly unusual fine thermohaline structure of intrusional nature. The mentioned kinematic and dynamic characteristics are examined in detail. An explanation is given for the unique nonisopycnic nature of the intrusional fine structure. All the reviewed data emphasize the frontal nature of the current and substantiate various significant structural differences between the Cromwell and Lomonosov Currents. Figures 2; references 28: 13 Russian, 15 Western.

[163-5303]

UDC 551.465

LOCAL MECHANISM OF EQUATORIAL COUNTERCURRENTS

Moscow OKEANOLOGIYA in Russian Vol 24, No 5, Sep-Oct 84 (manuscript received 6 Apr 83) pp 732-736

MIKHAYLOVA, E. N., POPOV, S. K. and SHAPIRO, N. B., Marine Hydrophysical Institute, Ukrainian Academy of Sciences, Sevastopol

[Abstract] In the theory of equatorial countercurrents the necessary conditions for current formation include a meridional nonuniformity of the Trades and the presence of shores. In this article it is shown that in a continuously stratified ocean there is another local mechanism of formation of equatorial countercurrents unrelated to the presence of shores, a possibility revealed in computations of the three-dimensional fields of currents and temperature in a nonlinear model of a baroclinic layer. This mechanism is represented as follows. Under the influence of a nonuniform wind a vertical velocity is excited at the lower boundary of the Ekman layer which changes

sign with advance from the south to the north so that subsidence to the south of the zone of calms undergoes a transition into an upwelling of waters to the north of it. This results in a rising of the isopycnic line in a northerly direction and as a result of geostrophicity, the appearance of an easterly gradient current. It is shown that this gradient current is concentrated in a baroclinic layer, is quite intensive and is directed against the wind. This problem is examined in the following formulation. The wind currents are in a zonal channel of constant depth on the f-plane. The fluid is assumed to be continuously stratified. The linear theory of the main thermocline is used on the assumption that the sought-for functions do not change in the zonal direction. In this formulation a hypothesis is proposed explaining the reasons for the subsurface countercurrents observed to the south of the equator in the Pacific and Atlantic Oceans. References: 5 Russian.

[163-5303]

UDC 551.465: 7.021.2

MODELING EVOLUTION OF UNSTABLE GEOSTROPHIC EDDIES IN BAROTROPIC OCEAN

Moscow OKEANOLOGIYA in Russian Vol 24, No 5, Sep-Oct 84 (manuscript received 22 Feb 83, after revision 17 May 83) pp 737-743

KOZLOV, V. F. and MAKAROV, V. G., Pacific Ocean Oceanological Institute, Far Eastern Scientific Center, USSR Academy of Sciences, Vladivostok

[Abstract] In the study of oceanic eddies the emphasis has been on those of a synoptic scale and little has been published on the behavior of structural eddy formations of lesser scales. The latter are legitimately studied in a quasigeostrophic approximation but the beta effect can be neglected. The contour dynamics method, which was developed for study of the behavior of regions with a constant vorticity, is particularly useful in studying these formations. This method has now been used in studying the evolution of regions of constant vorticity whose stationary configurations are unstable. This problem is examined in a barotropic model. This makes it possible to trace the evolution of eddy structures in the case of their loss of stability. All computations were made with fixed vorticity and a constant time interval in a Runge-Kutta scheme. Three series of numerical experiments were carried out: the first was for a study of the stability properties of Kirchhoff eddies, the second experiment involved a system of two eddies, and the third, m-symmetric eddies. These numerical experiments make it possible to determine criteria for the stability of stationary configurations which are close to the theoretical criteria. Different types of decay of unstable elliptical eddies are examined. At this time it is impossible to detect the transition from one possible stationary state to another. Figures 4; references 15: 5 Russian, 10 Western.

[163-5303]

UDC 551.465

SOME APPROXIMATIONS OF GEOPHYSICAL HYDRODYNAMICS

Moscow OKEANOLOGIYA in Russian Vol 24, No 5, Sep-Oct 84 (manuscript received 1 Apr 83, after revision 12 Jul 83) pp 744-749

BERESTOV, A. L., Oceanology Institute imeni P. P. Shirshov, USSR Academy of Sciences, Moscow

[Abstract] The different approximations used in the hydrodynamics of a rotating stratified fluid for averaged movements are reviewed. The objective of the study was a more precise determination of the fields of applicability of these approximations. The basic characteristics of the quasistatic approximation are set forth, followed by a discussion of the Boussinesq approximation and the equation for the conservation of mass. Next the equation for the evolution of entropy is analyzed and it is shown that neither the equation for the conservation of mass nor the equation for the evolution of entropy as ordinarily written lead to the appearance of new types of waves among the solutions of the equations of geophysical hydrodynamics. It is shown further that retention of the time derivatives of density and pressure in the equations for the conservation of mass and entropy evolution respectively does not lead to the appearance of new types of waves and makes possible a more precise description of processes transpiring in the entire thickness of the ocean or atmosphere. Allowance for the compressibility of sea water in the equation for the conservation of mass and the term $d_h P/c_0^2 dt$ in the expression for entropy exerts virtually no influence on the fundamental relationship describing the dynamics of currents and Rossby waves. References 10: 9 Russian, 1 Western.

[163-5303]

UDC 551.465.62

REPRESENTATION OF TEMPERATURE AND SALINITY FIELDS USING STATISTICALLY ORTHOGONAL FUNCTIONS (IN EXAMPLE OF POLYMODE DATA)

Moscow OKEANOLOGIYA in Russian Vol 24, No 5, Sep-Oct 84 (manuscript received 1 Apr 83, after revision 7 Sep 83) pp 756-763

FILYUSHKIN, Yu. B., Oceanology Institute imeni P. P. Shirshov, USSR Academy of Sciences, Moscow

[Abstract] The method of expansion in statistically orthogonal functions (SOF) is applied to the random fields of temperature T and salinity S on the basis of archival materials and data from the POLYMODE experiment. The method and these data are used in computing systems of eigenfunctions of temperature-salinity correlation matrices. These matrices were computed for 20 standard horizons from 0 to 1,100 m. Observational data used were from hydrological stations in a square 25-33°N, 66-74°W with a sounding depth not less than

1,100 m. The actual use of the sampled SOF requires a determination of their stability with transition from one sample to the next. If the SOF system ceases to be stable with use of different samples all the advantages are lost. The dependence of the SOF on spatial coordinates was investigated in two geographical regions; their spatial stability was confirmed. Next the stability of the SOF in time was studied, that is, with a change from season to season. It was found that stability of the eigenvectors of the temperature correlation matrix is retained from season to season, whereas the system has a lesser stability for the salinity correlation matrix. In order to exclude the influence of the upper layer of the ocean, which is subject to seasonal changes, systems of SOF were determined at 10 standard horizons from 250 to 1,100 m. As a result, the first three eigenvectors became more stable with transition from season to season. Seasonal changes exert virtually no influence on the temperature and salinity fields below 250 m and a unified system of SOF for such fields makes possible a considerable reduction of computations. The discussed properties apply to SOF obtained using data averaged in space (horizontally) and in time. Figures 5, tables 2; references: 6 Russian.

[163-5303]

UDC 551.464:546.18

FINE STRUCTURE OF VERTICAL DISTRIBUTION OF ORGANIC AND MINERAL PHOSPHORUS

Moscow OKEANOLOGIYA in Russian No 5, Sep-Oct 84 (manuscript received 2 Sep 81, after revision 2 Nov 82) pp 772-776

SAPOZHNIKOV, V. V. and ZUBAREVICH, V. L., All-Union Scientific Research Institute of Fishing and Oceanography, Moscow

[Abstract] The fine structure of the vertical distribution of organic and mineral phosphorus was studied in July-September 1980 aboard the "Akademik Knipovich" which investigated this distribution along 6, 8, 10, 12, 14, 16, 18, 20, 22, 25°S in the southeastern part of the Pacific Ocean from the 200-mile zone to 90°W. A total of 180 hydrological stations were occupied with bathometric samples being taken at the horizons 0, 10, 20, 30, 50, 75, 100, 150, 200, 400, 600, 1,000 and 1,200 m. A joint analysis of the vertical distribution of inorganic and organic P, the vertical distribution of oxygen and hydrochemical parameters (nitrates, nitrites, silica) revealed two types of vertical structure in productive regions. In the first type there is a maximum of organic P at the horizons 10-20 m; this corresponds to a minimum of phosphates and an oxygen maximum. In the second type there was a correspondence of the maximum of organic P at these same horizons to an oxygen minimum and ammonia maximum. The differences in the vertical structure of these hydrochemical parameters are attributable to the different times when samples were taken. The stations in the first group were occupied during the daytime and the others in the darkness. Apparently during the daytime the maximum of organic P corresponds to the photosynthesis maximum, during which phytoplankton utilizes inorganic phosphorus and releases oxygen.

The organic P maximum in the surface layer at nighttime is associated with the accumulation of metabolic products of animal organisms. At many stations, in addition to the photic and metabolic maxima, there is still another organic P maximum in the euphotic zone. It is usually situated in the jump layer and is formed as a result of accumulation of organic remains in the pycnocline, clearly of detrital origin. Figures 2; references 7: 5 Russian, 2 Western.
[163-5303]

UDC 551.24(261.24)

EVALUATING STRUCTURE-FORMING ROLE OF LATE PALEOZOIC AND MESOZOIC-CENOZOIC TECTONIC MOVEMENTS IN BALTIC SEA REGION

Moscow OKEANOLOGIYA in Russian Vol 24, No 5, Sep-Oct 84 (manuscript received 15 Dec 82, after revision 19 Apr 83) pp 794-800

SVIRIDOV, N. I., Atlantic Branch, Oceanology Institute imeni P. P. Shirshov, USSR Academy of Sciences, Kaliningrad

[Abstract] Recent research has indicated a need for reexamining points of view concerning the intensity of Late Paleozoic and Mesozoic-Cenozoic tectonic movements in the Baltic Sea region and their role in structure formation. Data from continuous seismic profiling and dredging, as well as other geological materials, made it possible to compile a schematic geological map of pre-Quaternary deposits, a map of plicative and disjunctive dislocations of the sedimentary cover and schematic seismological sections of the upper structural complex. It is shown that in the section of the sedimentary cover with several structural complexes there should be a regular simplification of the structure of the complexes from more ancient to more recent. It is concluded that the Late Paleozoic and Mesozoic-Cenozoic movements in the Baltic syneclide in intensity could be commensurable with the Caledonian movements, but their maximum intensity and maximum structure-forming role were expressed only in the lower part of the sedimentary section, in the lower structural complexes, but not in the upper part, where these movements, extinguished by the sedimentary stratum, were weak. Accordingly, there is no justification for judging the weakness of synchronous tectonic movements on the basis of the simple structure of the upper (Alpine) structural complex without allowance for the duration of development of structures and dislocations, thickness and absorbing properties of the sedimentary cover, especially since within the Baltic syneclide the upper structural complex nowhere lies directly on the basement. Unnecessary expenditures on exploration and reconnaissance work can result from failure to appreciate the structure-forming role of Late Paleozoic and Mesozoic-Cenozoic tectonic movements and failure to take into account data on the upper horizons of the sedimentary complex. Figures 3; references 11: 10 Russian, 1 Western.

[163-5303]

UDC 550.838:551.462(267)

PARAMETERS OF MAGNETICALLY ACTIVE LAYER OF INDICAN OCEAN DETERMINED FROM
DEEP DRILLING DATA AND MAGNETIC SURVEYS

Moscow OKEANOLOGIYA in Russian Vol 24, No 5, Sep-Oct 84 (manuscript received
22 Feb 83, after revision 12 Jul 83) pp 801-807

SHREYDER, A. A., Oceanology Institute imeni P. P. Shirshov, USSR Academy
of Sciences, Moscow

[Abstract] In the Indian Ocean the basalt basement has now been reached at 35 drilling points; magnetic properties were measured in the basalts of 24 of these holes. In the Indian Ocean the average penetration of a hole into the basaltic rocks was about 20 m. The age of the basalts determined by the K/Ar method can have an error $\pm 10\%$. Among the Indian Ocean boreholes 12 were situated in regions of reliably identified paleomagnetic anomalies. The magnetic characteristics of the basalts in them and the parameters of models of the magnetically active layer as published in different sources are cited in a table. The remanent magnetization of the basalts in Indian Ocean basalts is ~ 2 A/m. The available data on the age and angular parameters of the vector of magnetization of samples from abyssal holes in the Indian Ocean in general are quite consistent with the corresponding data obtained from paleomagnetic anomalies, indicating a relative reliability of the paleoreconstructions of its bottom. The observed discrepancies, if not the result of methodological errors, suggest that in a number of regions the parameters of the spreading paleoaxes must be determined more precisely. The remanent magnetization values prevailing in basalts from these holes were less by a factor of 2-10 than the values from model computations. Allowance for this finding in the modeling of paleomagnetic anomalies makes it necessary to introduce a correction for the traditional parameters of the layer.

Figures 3, tables 2; references 30: 2 Russian, 28 Western.

[163-5303]

UDC 551.46.01

AUTOMATION OF RADIOMETRIC MEASUREMENTS IN NUCLEAR OCEANOLOGY

Moscow OKEANOLOGIYA in Russian Vol 24, No 5, Sep-Oct 84 (manuscript received 20 Apr 83) pp 843-848

GRINBERG, K. V., KUPTSOV, V. M., LISKIN, V. A. and SITNIKOV, L. S., Oceanology Institute imeni P. P. Shirshov, USSR Academy of Sciences, Moscow

[Abstract] An automated system for the collection and processing of data was developed applicable to instrument complexes for determining the absolute age of bottom sediments by the radiocarbon and lead (^{210}Pb) method. The system includes an IEC interface which ensures the possibility of developing flexible systems with a great number of experimental devices (a block diagram

of the system is used in a detailed discussion of its operation). The IEC interface connects 8 detectors through a multichannel block of counters with different recording devices. The system provides for data collection from 6 radiocarbon detectors and 2 low-background beta counters. The radiocarbon detectors are two-channel fluid scintillation counters. The detectors, fabricated from low-background materials, are enclosed in a protective mercury shield with a wall thickness of 2.5 cm, surrounded by a 10-cm lead layer, for protection against cosmic rays and from radiation of surrounding objects. Measurements can be made at intervals of 1, 10, 100 and 1,000 sec. The system has been in laboratory use for three years, measurements being made around-the-clock, making it possible to obtain 40-45 radiocarbon datings per month. When determining the mean rate of sedimentation by the radioactive lead method the productivity is dependent on the activity of the measured samples. As an example of use of this system the article gives the results of determination of the age of bottom sediments in the Baltic Sea. The system is simple in operation and highly reliable during prolonged measurements. Figures 3, tables 2; references: 10 Russian.
[163-5303]

PHYSICS OF ATMOSPHERE

UDC: 551.513.1

SMALL COMPONENT SPECTRAL MODEL OF ANNUAL COURSE OF ZONAL ATMOSPHERIC CIRCULATION

Moscow IZVESTIYA AKADEMII NAUK SSSR: FIZIKA ATMOSFERY I OKEANA in Russian
Vol 20, No 5, May 84 (manuscript received 24 Feb 83) pp 349-355

GALIN, M. B. and KIRICHKOV, S. Ye., Atmospheric Physics Institute, USSR
Academy of Sciences

[Abstract] A study is presented of the annual course of changes in atmospheric circulation based on a model constructed in a previous work by the same authors. The model reduces the problem to integration of a system of ordinary 14th-degree differential equations. The annual change in solar heat input is represented as the annual change in temperature equilibrium by zones. Since Δt^r drives the entire dynamic system, as it decreases from winter to summer the intensity of dynamic processes also decreases. This results in a decrease both in the overall intensity of zonal change and in the intensity of the middle-latitude jet stream. The model reproduces the jet stream with an accuracy to within 1 m/s. Diagrams illustrate the evolution of zonal velocity fields at the 250- and 750-mbar levels and temperature at the 500-mbar level by months. The model properly describes the evolution of zonal wind and temperature fields through the annual cycle. The major shortcoming of the model is that although in July the jet stream is reproduced correctly, and the deviation of the latitudinal temperature gradient from that observed is not too great, the decrease in intensity of the energy cycle is excessive. This results from the use of the two-level approximation. Increasing the number of levels would improve accuracy. Figures 5, tables 1; references 21: 15 Russian, 6 Western.
[64-6508]

UDC: 551.511.6:551.465.7

PARAMETERIZATION OF APPARENT AND LATENT HEAT FLUXES ABOVE WATER SURFACE IN CALM WEATHER UNDER NATURAL CONDITIONS

Moscow IZVESTIYA AKADEMII NAUK SSSR: FIZIKA ATMOSFERY I OKEANA in Russian
Vol 20, No 5, May 84 (manuscript received 14 Jun 83) pp 364-371

GRACHEV, A. A. and PANIN, G. N., Atmospheric Physics Institute, USSR Academy of Sciences, Water Problems Institute, USSR Academy of Sciences

[Abstract] A brief review is presented of the history of development of equations for calculation of apparent and latent heat transfer between air and water in calm weather. The conclusions drawn in two previous works by the authors are tested on the basis of experimental materials obtained under natural conditions and recommendations are presented for calculation of heat flux under light wind conditions. The theoretical equations suggested in the previous works are found to describe the heat fluxes under near-calm conditions (wind speeds up to 3 m/s) quite well. Figures 4, references 20: 17 Russian, 3 Western.

[64-6508]

UDC: 551.521.3:551.576

MEAN FREE PATH LENGTH OF PHOTONS WITH BROKEN CLOUD COVER

Moscow IZVESTIYA AKADEMII NAUK SSSR: FIZIKA ATMOSFERY I OKEANA in Russian
Vol 20, No 5, May 84 (manuscript received 6 Jan 83) pp 372-378

SKORINOV, V. N. and TITOV, G. A., Atmospheric Optics Institute, Siberian Department, USSR Academy of Sciences

[Abstract] A study is made of the distribution function of photons by path length and the related mean path length of photons with a statistical approach to the problem of radiation transfer in a cloud field with stochastic geometrical structure. The horizontal dimensions of the clouds are assumed to be much greater than their vertical dimensions. It is found that the "open-closed" approximation yields satisfactory accuracy in calculation not only of mean radiant fluxes but also mean photon path lengths with multiple cloud layers partially covering the sky. However, the use of the method where small clouds of less than 1 km diameter covers a small portion of the sky leads to significant errors. Figures 5; references: 8 Russian.

[64-6508]

UDC: 551.510.42:551.521.3:543.275

CHEMICAL COMPOSITION OF COASTAL HAZE AEROSOL

Moscow IZVESTIYA AKADEMII NAUK SSSR: FIZIKA ATMOSFERY I OKEANA in Russian
Vol 20, No 5, May 84 (manuscript received 29 Oct 82; after revision 5 Jul 83)
pp 388-393

PKHALAGOV, Yu. A. and CHERKASOVA, T. G., Atmospheric Optics Institute,
Siberian Department, USSR Academy of Sciences

[Abstract] Several series of studies of the chemical composition of coastal haze aerosols were performed in 1977-1981 in various areas of the Black Sea Crimean coast. Areas were studied in which the prevailing winds were both offshore and onshore. In the area with the sea breeze the concentration of all elements tested except NH_4^+ were higher (Cl^- , SO_4^{2-} , HCO_3^- , NO_3^- , NH_4^+ , Na^+ , K^+ , Ca^{2+} , Mg^{2+} and pH). The elements which are the major components of sea salt varied widely in this area. Chlorine and sulfate ions represented over 60% of the total ions found. The concentration of nitrates was found to be independent of the type of air mass (continental or marine) as determined by prevailing wind direction. The difference in concentration of ions was found to be sufficient to allow identification of air masses in coastal areas. Tables 3; references 18: 12 Russian, 6 Western.

[64-6508]

UDC: 551.501.75:621.375.826:551.521.3

ERROR IN LASER CORRELATION WIND SPEED METERS RESULTING FROM VARIABLE ATMOSPHERIC TRANSPARENCY

Moscow IZVESTIYA AKADEMII NAUK SSSR: FIZIKA ATMOSFERY I OKEANA in Russian
Vol 20, No 5, May 84 (manuscript received 3 Jan 83) pp 440-443

MATVIYENKO, G. G., Atmospheric Physics Institute, Siberian Department, USSR
Academy of Sciences

[Abstract] A theoretical estimate is presented of the error in correlation measurements caused by variable transparency of the atmosphere through which the laser beam propagates. A graph shows the variation in error of velocity measurement resulting from fluctuations in transparency as a function of optical properties of the atmosphere. The error due to the influence of atmospheric transparency is found to be negligible in relatively clear air up to 3-5 km. As atmospheric turbidity increases, error of this type becomes significant. Figures 1; references 8: 6 Russian, 2 Western.

[64-6508]

UDC: 536.25

CONVECTIVE INSTABILITY OF HORIZONTAL LAYER OF BINARY MIXTURE

Moscow IZVESTIYA AKADEMII NAUK SSSR: FIZIKA ATMOSFERY I OKEANA in Russian
Vol 20, No 5, May 84 (manuscript received 21 Dec 82) pp 444-446

KOLESOV, V. V., URINTSEV, A. L. and YUDOVICH, V. I., Rostov-on-Don State
University

[Abstract] It is assumed that a viscous heat-conducting fluid containing an impurity fills an infinite flat horizontal layer. The lower boundary of the layer is a solid surface with a constant temperature. The free upper boundary is not deformed and has no shear stress. Above the layer is a nonmoving gas with quasi-steady temperature distribution. The heat flux through a vertical line in the atmosphere far from the free surface of the fluid is considered fixed. The temperature and normal component of heat flow are continuous upon transition through the free surface. The impurity does not flow through the boundary layer. The problem is to determine the velocity vector, pressure, temperature of the fluid, temperature of the atmosphere and concentration of the impurity in dimensionless form. Tables 2; references: 4 Russian.
[64-6508]

UDC: 550.388.2

IONOSPHERIC EFFECTS OF SEASONAL AND DIURNAL VARIATIONS OF ELECTRIC FIELDS
IN EQUATORIAL F-REGION

Moscow GEOMAGNETIZM I AERONOMIYA in Russian Vol 24, No 3, May-Jun 84
(manuscript received 2 Jul 82; after revision 4 Oct 83) pp 393-397

KASHCHENKO, N. M. and NIKITIN, M. A., Kaliningrad State University

[Abstract] Results are presented from numerical experiments intended to determine cyclical, seasonal and daily effects in the behavior of the equatorial F-region corresponding to cyclical, seasonal and daily variations in electric fields at low latitudes. An ionospheric model based on a single ion (O^+) diffusion approximation considering the three-dimensional nature of transfer of ionospheric plasma was used. The results of model calculations demonstrate that averaged data on daily variations of the longitudinal components in electric field intensity can be used to retrieve median N_mF values with acceptable accuracy. It is found that in the equatorial ionosphere there is a strong correlation between the behavior of the F-region and variations in electric field intensity. The median variations in the longitudinal component of the electric field thus allow satisfactory determination of the mean dynamics and structure of the equatorial F-region. They also indicate that optimum determination of specifics of the behavior of the equatorial F-region must consider the individual specifics of daily variations in the longitudinal component of the electric field for specific days. Figures 3; references 14: 3 Russian, 11 Western.

[12-6508]

UDC: 550.388.2

INFLUENCE OF INTERNAL GRAVITY WAVES ON F LAYER

Moscow GEOMAGNETIZM I AERONOMIYA in Russian Vol 24, No 3, May-Jun 84
(manuscript received 20 Jun 83) pp 398-402

DUDEBULIDZE, G. G. and PATARAYA, A. D., Abastumani Astrophysical Observatory

[Abstract] A nonlinear equation is derived for internal gravity waves in a three-dimensional case and its approximate soliton solution is obtained. The solution of the equation for the distribution of electron concentration by altitude in the F layer is presented for the case near the maximum of electron concentration distribution when vertically moving disturbances consist of both linear and nonlinear waves. Figures 2; references 10: 7 Russian, 3 Western.

[12-6508]

UDC: 550.388.2

UNIVERSAL TIME EFFECTS IN POLAR IONOSPHERE

Moscow GEOMAGNETIZM I AERONOMIYA in Russian Vol 24, No 3, May-Jun 84
(manuscript received 29 Jun 83; after revision 10 Nov 83) pp 403-406

MAKSIMOVA, N. M. and OSIPOV, N. K., Krasnoyarsk Institute of Nonferrous Metals

[Abstract] A description is presented of the effect of testing variations in space-time distribution of electron concentration in the polar ionosphere by vertical sounding and incoherent scattering methods, as well as by direct satellite measurements. Results of mathematical modeling of these effects by a system of programs presented in a previous work are reported. It is assumed that the results of comparison of experimental data with model data can serve as a basis for testing the correctness of the physical principles upon which the algorithms for the polar ionosphere volumetric structure programs were based, as well as the correctness of the mathematical apparatus used. The development of UT effects leads to a constant unsteadiness in the polar ionosphere, manifested as constant restructuring. Direct satellite measurements in this situation are an effective means for studying such variations over characteristic time intervals of 1.5 to 2 hours, or even shorter times if several satellites are used. Figures 3; references 8: 3 Russian, 5 Western.
[12-6508]

UDC: 550.388.2

SPREADING OF GREATLY EXTENDED INHOMOGENEITIES IN UPPER IONOSPHERE

Moscow GEOMAGNETIZM I AERONOMIYA in Russian Vol 24, No 3, May-Jun 84
(manuscript received 13 Jun 83) pp 407-413

BLAUNSSTEYN, N. Sh. and TSEDILINA, Ye. Ye., Terrestrial Magnetism,
Ionosphere and Radio Wave Propagation Institute, USSR Academy of Sciences;
Bel'sk State Pedagogic Institute, Moldavian SSR

[Abstract] The influence of inhomogeneities in ionospheric plasma is particularly great in the case of those which are greatly extended in the direction of the magnetic field. This influence determines the form and rate of diffuse spreading of inhomogeneities and leads to a number of new effects such as splitting of inhomogeneities, upward rising of inhomogeneities and their penetration into the magnetosphere. This article studies diffuse spreading of weak inhomogeneities in the ionosphere. An approximate solution of the problem is used, according to which the distribution of concentration in the process of spreading of a quasi-neutral inhomogeneity in a weakly ionized plasma can be represented as the sum of two components, each of which can be determined by an ordinary diffusion equation in an anisotropic medium for electrons and ions diffusing at double velocity. New effects are detected which are characteristics for inhomogeneities greatly extended along the H axis. The influence of recombination on spreading of the inhomogeneity is found to be slight. The major contribution of recombination is observed at low altitudes and leads to a more rapid attenuation of the profile at altitudes below 120 km. The change in form of greatly extended inhomogeneities in the ionosphere, splitting of inhomogeneities into two, upward rise and extension into the magnetosphere observed in this study are caused by inhomogeneity of the ionosphere throughout its height. An analysis of stages of relaxation of artificial inhomogeneities should therefore possibly include the influence of ionospheric inhomogeneity. Figures 3; references 14: 13 Russian, 1 Western.

[12-6508]

UDC: 550.388.2

EVOLUTION OF STRONG INHOMOGENEITIES IN IONOSPHERIC PLASMA. I.

Moscow GEOMAGNETIZM I AERONOMIYA in Russian Vol 24, No 3, May-Jun 84
(manuscript received 7 Jul 83) pp 414-419

ROZHANSKIY, V. A. and TSENDIN, L. D., Leningrad Polytechnic Institute

[Abstract] Analytic solutions are presented for a number of univariate problems related to evolution of inhomogeneities in the ionosphere where $eE_0 \gg T/a$. The physical cause of formation of sharply inhomogeneous concentration profiles similar to shock waves in gas dynamics is found. The

total electric field is determined by the profile of phonon ion concentrations \tilde{N}_2 . At first, while $N_2 \sim N_2^{(0)}$, the initial N_1 profile begins to move at a velocity $b_1 p E_0$. An area of low N_2 is formed at the leading edge. Particles from the low concentration area fill the initial profile, decreasing the electric field E in this area. Restructuring of the electric field within the initial profile occurs during the time of change $\Delta N_2 = -\Delta N_1 \sim 1$. The electric field at the leading edge increases to about $A E_0$ in this time and the depth of the low concentration area is about $N_2 \sim A^{-1}$. During this same time a jump occurs at the leading edge. Subsequently, the N_2 concentration in the initial profile increases, while E decreases, so that the loss time of the major quantity of injected ions is about $a A / b_1 p E_0$. The maximum rate of loss in the initial stage is reached where $A \gg 1$, then decreases with further increases in A . Figures 3; references 11: 7 Russian, 4 Western. [12-6508]

UDC: 550.388.2

ANISOTROPY OF ALFVÉN WAVE ABSORPTION IN IONOSPHERE

Moscow GEOMAGNETIZM I AERONOMIYA in Russian Vol 24, No 3, May-Jun 84
(manuscript received 17 Oct 83) pp 429-431

GIVISHVILI, G. V., LOBACHEVSKIY, L. A., FISKINA, M. V. and SHVARTSBURG, A. B.,
Terrestrial Magnetism, Ionosphere and Radio Wave Propagation Institute,
USSR Academy of Sciences

[Abstract] A study is made of the propagation of long Alfvén waves, radiated in the F layer at frequencies less than the ionic gyrofrequency, through the ionosphere. Absorption anisotropy increases greatly in the area where the collision frequency of electrons is less than their gyrofrequency while the reverse is true for ions. The refractive index of Alfvén waves and the attenuation decrement in the direction of propagation are calculated. Calculation of low-frequency absorption for the middle and low latitudes indicates the unique nature of absorption in this frequency range. The waves do not reach the earth, being reflected at altitudes of about 140 km. The spectral distribution of the attenuation decrement contains a minimum, a transparency window in the plane of the magnetic meridian at 4 to 8 Hz. The anisotropy of wave attenuation has great decrements for propagation across the field. The altitude profile of the wave attenuation decrement indicates the existence of a maximum at 160 km, where the decrement is about 22. Figures 3; references 2: 1 Russian, 1 Western.

[12-6508]

UDC: 550.388.8

ALTITUDE OF AURORAL SCATTERING OBSERVED ALONG AURORAL ELECTROJETS

Moscow GEOMAGNETIZM I AERONOMIYA in Russian Vol 24, No 3, May-Jun 84
(manuscript received 8 Aug 83) pp 432-435

TIMOFEYEV, Ye. Ye., Polar Geophysics Institute, Kola Affiliate, USSR Academy of Sciences

[Abstract] An analysis is presented of the behavior of altitude of radio auroras observed in the direction of electrojets for a single type of scattering--diffuse radio auroral layers (type DB). Radial auroral altitudes were measured by vertical interferometry. The results of statistical analysis of probability of appearance of various scattering altitudes are presented graphically. The altitudes average 10 km higher in the evening sector in the area of the easterly electrojet than in the westerly electrojet in the morning sector. The experimental results contradict the theory of convective loss of plasma waves responsible for the radio aurora developed in the American studies of Kaw and Wang. Figures 3; references 12: 3 Russian, 9 Western.

[12-6508]

UDC: 550.385.4/:550.388.2

CORRELATION OF RING CURRENT AND IONOSPHERIC GAP IN MORNING AND EVENING HOURS

Moscow GEOMAGNETIZM I AERONOMIYA in Russian Vol 24, No 3, May-Jun 84
(manuscript received 26 Jun 83) pp 442-447

BESPROZVANNAYA, A. S., GDALEVICH, G. L., OZEROV, V. D., SOSNOVETS, E. N., TVERSKAYA, L. V. and KHOROSHEVA, O. V., Arctic and Antarctic Institute, State Hydrometeorological Committee; Space Research Institute, USSR Academy of Sciences; Nuclear Physics Institute, Moscow State University

[Abstract] Results are presented from simultaneous measurements of ring current protons and ion concentrations in the external ionosphere by the Cosmos-900 satellite in circular orbit about 500 km in altitude, orbital inclination 83°, orbital period about 1.5 hours. Studies were made 1 to 2 December 1977. It is found that in the evening sector the inner edge of the ring current coincides with the position of the plasmapause, so that ring current losses may be determined by processes of interaction between hot and cold plasma at the plasmapause. In the morning sector the inner edge of the ring current is not in the plasmapause, so that ring current losses cannot be related to processes developing at the plasmapause. They may be determined by processes of interaction between the ring current and the detached cold plasma which moves to the deeper L shells in the process of drift under the influence of the westerly electric field. Utilization of data from vertical ionospheric soundings allows determination of structural changes in ionization

during magnetically active periods, probably related to the development of longitudinal currents. Figures 5; references 13: 7 Russian, 6 Western.
[12-6508]

UDC: 550.388.2

DISTURBANCES IN STRUCTURE OF LOWER IONOSPHERE AT TERMINATORS BASED ON RESULTS OF WIDE-BAND LW SOUNDING

Moscow GEOMAGNETIZM I AERONOMIYA in Russian Vol 24, No 3, May-Jun 84
(manuscript received 11 May 83) pp 496-498

ICNAT'YEV, G. F. and OSIPOV, N. K., Geophysics Department, Krasnoyarsk State University

[Abstract] The purpose of this study is experimental diagnosis of ionospheric disturbances which appear along the radio transmission path of a wide-band noise-like signal when correlation reception is used. Studies of these disturbances in the area of the terminators is of practical interest because the passage of the terminator through a radio transmission path may result in deterioration of communication conditions. Measurements were made in the 100-KHz band on radio paths in the middle latitudes of the Soviet Union, oriented from west to east. The Barker code was used to simulate the wide-band noise-like signals. The results illustrate the possibility of the correlation reception method for wide-band LW signals as a diagnostic method in studies of the lower ionosphere. Figures 2.

[12-6508]

UDC: 550.388.2

FORESHORTENED SHORT-WAVE SCATTERING ON ARTIFICIAL IONOSPHERIC INHOMOGENEITIES

Moscow GEOMAGNETIZM I AERONOMIYA in Russian Vol 24, No 3, May-Jun 84
(manuscript received 29 Jul 83) pp 503-504

VOVK, V. Ya., YERUKHIMOV, L. M., MAKSIMENKO, O. I., MITYAKOVA, E. Ye., MITYAKOV, N. A., VOGUTA, N. M., NEKRASOV, B. Yu., URYADOV, V. P., SHIROCHKOV, A. V., SHUMILOV, I. A. and YUKHIMUK, A. K., Arctic and Antarctic Scientific Research Institute; Gor'kiy Radio Physics Institute; Geophysics Institute, Ukrainian Academy of Sciences

[Abstract] Synchronous slant soundings of the ionosphere were performed in April, May and September of 1982 in the morning and evening hours. The experiments showed that reflections observed on the diagram as a mode with a delay relative to the 1F2 mode were recorded only on the Murmansk-Kiev path, not the Leningrad-Kiev, Moscow-Kiev or Kheys Island-Kiev paths. The observations of the foreshortening mode generated indicate that it develops when the

heating frequency is 81 to 88% of the critical frequency of the F2 layer at the heated point. It is found that the slant sounding equipment is an effective means for studying foreshortening scattering of radio waves on artificial ionospheric inhomogeneities created by powerful (up to 100 MW effective power) short-wave transmitters. Foreshortening modes are observed with a mean probability of 34.8% over the Murmansk-Kiev path at frequencies of 0.5-6 MHz. Figures 2, tables 1; references: 2 Russian.
[12-6508]

UDC: 551.511.32

MODELING OF SHEAR FLOW IN A STRATIFIED FLUID

Moscow IZVESTIYA AKADEMII NAUK SSSR: FIZIKA ATMOSFERY I OKEANA in Russian
Vol 20, No 6, Jun 84 (manuscript received 28 Feb 83) pp 451-455

BATCHAYEV, A.M., DOVZHENKO, V.A. and KURGANSKIY, M.V., Atmospheric Physics Institute, USSR Academy of Sciences

[Abstract] An experimental study is presented of an analog of a Kolmogorov flow in a stratified fluid and its stability is studied. Results are presented from the first experiments on laboratory modeling of a Kolmogorov flow in a stratified fluid. Modeling was performed by magnetohydrodynamic excitation of movement of an electrolyte in a rectangular vessel measuring 300 x 17 x 200 mm with the two side walls curved. A loss of stability in the area occupied by the flow clearly greater than 1. Local horizontal layers are generated with small eddies. An equation is derived which satisfactorily describes the experimental results for Richardson number much greater than 1. Figures 3; references: 4 Russian.

[15-6508]

UDC: 551.513.3

LONG NONLINEAR WAVES IN LAYERS OF SUDDEN CHANGES IN WIND VELOCITY

Moscow IZVESTIYA AKADEMII NAUK SSSR: FIZIKA ATMOSFERY I OKEANA in Russian
Vol 20, No 6, Jun 84 (manuscript received 2 Mar 83) pp 469-475

ROMANOVA, N.N., Atmospheric Physics Institute, USSR Academy of Sciences

[Abstract] A study is made of internal gravity waves in a model of the atmosphere containing a relatively thin arbitrarily stratified surface layer and an infinite homogeneous upper layer moving at constant velocity relative to the lower layer. It is assumed that the local Richardson number is always greater than 1/4, eliminating hydrodynamic instability. It is shown that slightly nonlinear internal waves propagating along the interface of the layers are described in the long-wave approximation by a generalized

Benjamin-Ono-Korteweg-deVries equation. It is shown that internal waves may exist in homogeneous media in which there is an area of sudden change in flow velocity. If the profile has an arbitrary structure in the surface layer of finite thickness and is constant in the upper layer, slightly nonlinear long waves are described by the Benjamin-Ono equation. References 5: 4 Russian, 1 Western.

[15-6508]

UDC: 551.596.1:551.510.535

ATMOSPHERIC REACTION TO WEAK SURFACE EXPLOSION

Moscow IZVESTIYA AKADEMII NAUK SSSR: FIZIKA ATMOSFERY I OKEANA in Russian
Vol 20, No 6, Jun 84 (manuscript received 28 Dec 82; after revision 20 Jun 83)
pp 476-484

ORLOV, V.V. and URALOV, A.M., Siberian Institute of Terrestrial Magnetism,
Ionosphere and Radio Wave Propagation, USSR Academy of Sciences

[Abstract] An estimate is presented of parameters of the disturbance propagating from the location of an explosion into the upper atmosphere. A gas dynamic analysis was conducted in the approximation of nonlinear acoustics for rays not entering the atmospheric waveguide. This solution allows calculation of the profile of Doppler shifting of the frequency of a radio signal reflected from the ionosphere disturbed by an explosion, estimation of the residual displacement of the levels in the atmosphere and their irreversible heating and determination of characteristics of the transient wave process as a result of which the shifted area returns to its initial position. It is assumed that the explosion is a point process occurring on the underlying surface beneath the atmosphere. Figures 4, tables 1; references 12: 11 Russian, 1 Western.
[15-6508]

UDC: 551.501.724:551.501.75

EXPERIMENTAL RESULTS OF TEMPERATURE-WIND SOUNDINGS OF THE ATMOSPHERE BY THE RADIO ACOUSTICAL METHOD

Moscow IZVESTIYA AKADEMII NAUK SSSR: FIZIKA ATMOSFERY I OKEANA in Russian
Vol 20, No 6, Jun 84 (manuscript received 31 Jan 83) pp 495-500

BABKIN, S.I., PROSHKIN, Ye.G. and UL'YANOV, Yu.N., Khar'kov Radio Electronics
Institute

[Abstract] An experimental estimate is presented of the accuracy characteristics and a study is made of the possibility of application of the method of radioacoustical soundings and the apparatus of a single-position radio acoustical sounding system for temperature-wind soundings in the atmospheric

boundary layer. The accuracy of measurement of weather parameters by the 10 cm radioacoustical sounding system is found to vary with wind velocity and is sensitive to the presence of wind shears. If two slant soundings are made simultaneously the height of the temperature-wind soundings can be increased under both moderate and strong wind conditions. Accuracy satisfactory for meteorological practice can be achieved with winds up to 5-7 m/s. The method is considered quite promising for studies of the boundary layer using mobile centimeter and decimeter band systems up to about 200-500 m altitude with a resolution of 5 to 30 m. Low-frequency (meter waveband) three-position systems can increase the effective height. Figures 2, tables 1; references 12: 8 Russian, 4 Western.
[15-6508]

UDC: 551.501.81

DETERMINATION OF TOTAL MOISTURE CONTENT IN CLOUD-FREE ATMOSPHERE BY RELATIVE RADIO EMISSION MEASUREMENTS

Moscow IZVESTIYA AKADEMII NAUK SSSR: FIZIKA ATMOSFERY I OKEANA in Russian
Vol 20, No 6, Jun 84 (manuscript received 7 Jan 83) pp 501-504

ALESHIN, V.I., PLECHKOV, V.M. and BARKAN, T.Ye., Applied Physics Institute,
USSR Academy of Sciences

[Abstract] A method is suggested for determining the total moisture content in the cloud-free atmosphere by relative measurement of atmospheric brightness temperature. In the method at three rather similar elevation angles for which atmospheric emission is isotropic with the antenna system used, the levels of proportional brightness temperature of the atmosphere are recorded. The relationship of differences of these levels and known surface temperature and moisture content are used to find the total atmospheric moisture content. A regression equation is derived relating the mean square measurement error to the error in determination of total water vapor mass in a column of the atmosphere. The total error is found to be 3-6%. Figure 1, tables 1; references: 4 Russian.
[15-6508]

UDC: 551.501.8

EXPERIMENTAL STUDY OF ANISOTROPY OF SCATTERING OF RADAR SIGNALS BY CLOUDS
AND PRECIPITATION

Moscow IZVESTIYA AKADEMII NAUK SSSR: FIZIKA ATMOSFERY I OKEANA in Russian
Vol 20, No 6, Jun 84 (manuscript received 3 Jan 83; after revision 11 Jul 83)
pp 505-510

BADULIN, N.N., BATSULA, A.P., KUL'SHENEVA, Ye.B., LUK'YANOV, S.P., MASALOV,
Ye.V. and TATARINOV, V.N., Tomsk Institute of Automated Management Systems
and Electronics

[Abstract] A study is made of the possibility of determining the geometric and electrophysical characteristics of meteorological targets by radar estimation of the radio wave scattering anisotropy of clouds and precipitation. Representation of an elementary meteorological target as an ellipsoid of revolution allows the dimensionless characteristic of scattering anisotropy to be computed. Analysis of scattering anisotropy shows that the eigenvalues of the meteorological target polarizability tensor are invariant to rotations in the polarization plane. Simple manipulation of the polarization of the radiation in a single-channel weather radar can be used to determine the degree of anisotropy. The degree of anisotropy of a target consisting of large-drop precipitation is related to the geometric particle form factor, which in turn is determined by the equivalent diameter of the particles. The use of estimates of the anisotropy coefficient for radar soundings of clouds and precipitation allows determination of additional information on microphysical characteristics of the scattering objects. The technical implementation of measurement of the anisotropy coefficient is rather simple and allows highly accurate measurements. Problems of interpretation of experimental data on anisotropy of meteorological objects is a worthy subject of attention and further study. Figures 3, tables 3; references: 5 Russian.

[15-6508]

UDC: 551.501.771

DETERMINING ATMOSPHERIC MOISTURE CONTENT FROM DIFFERENCES IN TWO-FREQUENCY
MICROWAVE RADIATION MEASUREMENTS

Moscow IZVESTIYA AKADEMII NAUK SSSR: FIZIKA ATMOSFERY I OKEANA in Russian
Vol 20, No 7, Jul 84 (manuscript received 17 Feb 83) pp 566-574

RASSADOVSKIY, V. A. and TROITSKIY, A. V., Radio Physics Scientific Research
Institute

[Abstract] Measurements of outgoing atmospheric radio radiation at the water vapor line at 1.35 cm and in the 8 mm transparency window can yield reliable information on the integral moisture content and integral water reserves of clouds in the atmosphere above a water surface. A detailed comparison is

presented with the single-wave method. Results are presented from experimental determination of moisture content and reserves performed from an aircraft. Although the sensitivity of the difference signal to integral moisture content is three times lower than the single-frequency signal, a great improvement is achieved in the accuracy of radiometric measurements (by a factor of about 10) and the influence of the underlying surface and cloud cover is significantly suppressed, allowing the accuracy of determination to be increased by a factor of 2 to 3, to about 5%. Figures 5, tables 1; references: 15 Russian.

[24-6508]

UDC: 551.521.1(261/264)

STUDY OF INTEGRAL AND SPECTRAL DIRECT SOLAR RADIATION OVER ATLANTIC

Moscow IZVESTIYA AKADEMII NAUK SSSR: FIZIKA ATMOSFERY I OKEANA in Russian Vol 20, No 7, Jul 84 (manuscript received 28 Feb 83) pp 599-605

LEONT'YEVA, Ye. N. and PLAKHINA, I.N., Atmospheric Physics Institute, USSR Academy of Sciences

[Abstract] Measurements were performed in July 1982 at 39°N, 209°W in the Atlantic Ocean from the research vessel "Akademik Kurchatov" to determine direct solar integral radiation S , as well as fluxes in three nonoverlapping spectral areas: $S_1(\lambda < 0.525 \mu\text{m})$, $S_3(0.38-0.7 \mu\text{m})$ and $S_4(0.7-2.8 \mu\text{m})$, as well as $S_2(0.525-0.63 \mu\text{m})$. Radiation fluxes were measured perpendicular to the line of sight to the sun with a standard thermoelectric actinometer. Results of the measurements are presented in tabular and graphic form. The transfer coefficient values characterizing the spectral composition of direct solar radiation are about 44 and 54% for photosynthetically active radiation and near-infrared areas. The variability of direct solar radiation above the mid-Atlantic was determined by variations in atmospheric aerosol composition over the ocean throughout the observation period. The mean τ_{λ_0} value was about 0.17, varying from 0.12 to 0.25. The direct incident solar radiation is approximately equally attenuated by the three major components (molecular scattering plus ozone, water vapor and aerosol). Figures 6, tables 2; references: 8 Russian.

[24-6508]

UDC: 551.591.1

ROLE OF DIFFUSE SCATTERED LIGHT IN MEASUREMENTS OF THE RODIONOV EFFECT

Moscow IZVESTIYA AKADEMII NAUK SSSR: FIZIKA ATMOSFERY I OKEANA in Russian
Vol 20, No 7, Jul 84 (manuscript received 12 Mar 83) pp 652-653

PAVLOVA-RODIONOVA, Ye. N.

[Abstract] A criticism is presented of some details of a study published in 1978 by V. Ye. Pavlov on photometric investigation of the ultraviolet radiation of the sun near the horizon. The author states that Pavlov reported the effect of anomalous transparency in the atmosphere to vary as a function of the spectral interval used, i.e., the spectral width of the input of the optical devices used. Pavlov interprets what the author of this work considers to be a typical curve for anomalous transparency as a false anomalous transparency effect. The author of this work concludes that the variations reported by Pavlov were probably caused by selectively scattering water aerosols as previously reported by Rodionov, even though Pavlov's work was performed in an area with dry continental climate. References 6: 5 Russian, 1 Western.

[24-6508]

UDC: 551.577.1:519.245

MODELING OF RADIOTHERMAL RADIATION OF RAIN BY MONTE-CARLO METHOD

Moscow IZVESTIYA AKADEMII NAUK SSSR: FIZIKA ATMOSFERY I OKEANA in Russian
Vol 20, No 9, Sep 84 (manuscript received 27 Jul 82; after revision 30 Aug 83)
pp 820-826

SMIRNOV, M. T., Radio Engineering and Electronics Institute, USSR Academy of Sciences

[Abstract] The transfer equation in precipitation is solved for the microwave band of radiation by the Monte-Carlo method, the main advantage of which is its simple algorithm and clarity of interpretation of the transfer process. Full solution of the transfer equation would require great amounts of machine time. Therefore, in cases such as solutions of the inverse problem of remote soundings, the ability to describe the radiation of rain by means of an approximate equation is important. Several results are presented from modeling the radiation of a plane homogeneous isothermal layer and an atmosphere which is heterogeneous in the vertical direction with rain over an underlying surface. Numerical modeling of the transfer process by the Monte-Carlo method allows clear analysis of the role played by the main parameters of the scattering medium in the formation of its radiation. The intensity of radiation is found to be little dependent on the scattering index, and the model of homogeneous scattering is correct for approximate description. Figures 6, references 11: 9 Russian, 2 Western.

[95-6508]

UDC: 551.521.1:551.510.42

APPLICABILITY OF VERTICALLY HOMOGENEOUS ATMOSPHERIC MODELS FOR REMOTE SOUNDINGS

Moscow IZVESTIYA AKADEMII NAUK SSSR: FIZIKA ATMOSFERY I OKEANA in Russian
Vol 20, No 9, Sep 84 (manuscript received 23 Feb 83) pp 827-833

KEEVALLIK, S. Kh. and KHEYNLO, A. G., Astrophysics and Atmospheric Physics Institute, Estonian Academy of Sciences

[Abstract] An attempt is made to clarify to what extent and under what actual conditions the approximation of a vertically homogeneous atmosphere can be used in studies of remote soundings. Three models of a plane-parallel cloudless atmosphere were used: the first was constructed on the basis of McClatchey tables giving the vertical distribution of molecular and aerosol scattering and absorption coefficients, using 30 layers - 1 km thick up to 25 km, 5 km thick up to 50 km. Models 2 and 3 were produced by simplification. Model 2 differs only in what a weighted mean value of aerosol scattering was used for the entire thickness. Model 3 is fully homogeneous through its height. Determination of the transfer function using only the known total optical thickness of the atmosphere is found to lead to serious errors. The homogeneous atmosphere approximation yields elevated values for the atmospheric transfer function above the sea. The degree of error differs for different parts of the spectrum. Figures 3, tables 1; references 4: 3 Russian, 1 Western.

[95-6508]

UDC: 502.55(203):551.510.41:551.521.1

SPECTROSCOPIC STUDY OF GAS POLLUTANTS IN ATMOSPHERE OVER LARGE CITIES (A REVIEW)

Moscow IZVESTIYA AKADEMII NAUK SSSR: FIZIKA ATMOSFERY I OKEANA in Russian
Vol 20, No 10, Oct 84 (manuscript received 21 Jun 83) pp 883-900

DIANOV-KLOKOV, V.I., Atmospheric Physics Institute, USSR Academy of Sciences

[Abstract] The spectroscopic method of determining the total content of gas impurity along a line of sight is based on the use of transparency spectra of the entire atmosphere. The intensity of lines or groups of absorption lines belonging to the component being studied is used to determine its total content along the line of sight. Practical spectroscopic studies of atmospheric pollution over cities in the USSR and Bulgaria, made by spectroscopic measurement of sunlight, have been primarily centered on carbon monoxide. The characteristic dimensions of the clouds of anthropogenic carbon monoxide above cities are estimated. It is found that the influence of the city of Moscow extends out to 2.5 - 3 times the radius of the city itself. The spectroscopic method using the sun as a light source has several advantages

over direct sampling of the atmosphere: it requires less labor, is less expensive and allows sampling of the entire depth of the atmosphere at once, rather than sampling only of the gas near the surface. Figures 14, tables 2; references 29: 20 Russian, 9 Western.
[155-6508]

UDC: 551.558.21:551.510.5

COMPARISON OF OBSERVATIONS OF OROGRAPHIC DISTURBANCES IN THE TROPOSPHERE AND UPPER ATMOSPHERE

Moscow IZVESTIYA AKADEMII NAUK SSSR: FIZIKA ATMOSFERY I OKEANA in Russian Vol 20, No 10, Oct 84 (manuscript received 29 Apr 83) pp 901-906

PERTSEV, N. N., Atmospheric Physics Institute, USSR Academy of Sciences

[Abstract] Earlier works have shown that when the wind blows over the Urals Range, temperature disturbances arise in the upper atmosphere. It is assumed that these disturbances result from packets of internal gravity waves of orographic origin propagating from the lower atmosphere into the upper atmosphere. This study tested this assumption on the basis of measurements in the troposphere and estimation of the parameters of such wave packets. Aircraft measurements in January-February 1981 included studies of air temperature along the flight path. The measurement results were analyzed to determine wave components in the temperature recordings. It was found that wind flow around mountain obstacles produces short wave packets, 5 to 20 periods in length. Both standing and traveling waves develop. The parameters of the standing waves are estimated and it is concluded that they could be the cause of the changes observed in the upper atmosphere. Figure 1, tables 1; references 7: 5 Russian, 2 Western.
[155-6508]

UDC: 551.513.1:551.543

OBSERVATIONS OF COHERENT PULSATIONS OF CHARACTERISTICS IN ATMOSPHERE WITH PERIOD OF ABOUT 1.5 HOURS

Moscow IZVESTIYA AKADEMII NAUK SSSR: FIZIKA ATMOSFERY I OKEANA in Russian Vol 20, No 10, Oct 84 (manuscript received 20 Sep 82; after revision 7 May 84) pp 922-928

FERRONSKIY, S. V., Problems Institute, USSR Academy of Sciences

[Abstract] The purpose of this study is to utilize observational data to check for the existence of virial oscillations in the earth's atmosphere with a period of about 1.5 hours, theoretically predicted in a previous work by the same author. The virial method of solving hydrodynamics problems

considers the field of attraction of the matter involved. It consists of derivation from the equations of motion of a chain of moment equations, each of which describes the change in the corresponding moment of distribution of mass density in the system. Results are presented from spectral analysis of experimental recordings of air temperature made on a television transmitting tower. Spectral processing of recordings of variations in pressure are used to demonstrate the virial pulsations in the earth's atmosphere with a period of 1.4 hours, observed in the middle latitudes of the northern hemisphere as well as the lower latitudes. The oscillations are coherent over long time intervals and are observed in both pressure and temperature in the lower layer of the atmosphere and at various points on the earth during different seasons and years. Figures 3, tables 1; references: 4 Russian.

[155-6508]

UDC: 551.521.14:535.361

DIFFUSE REFLECTION OF LIGHT FROM TURBID CONSERVATIVE MEDIUM OF FINITE THICKNESS WITH INCIDENCE OF BEAM ON SURFACE OF SCATTERER GLANCING

Moscow IZVESTIYA AKADEMII NAUK SSSR: FIZIKA ATMOSFERY I OKEANA in Russian
Vol 20, No 10, Oct 84 (manuscript received 1 Nov 82; after revision 3 May 83)
pp 929-938

KUZOVLEV, A.I. and REMIZOVICH, V.S., Moscow Engineering Physics Institute

[Abstract] A theoretical study is presented of the process of low-angle reflection of light from a dense scattering medium of finite thickness. Using the Boltzman transfer equation considering conditions at both boundaries of the scattering layer, a simple analytic expression is used for the angular spectrum of reflected radiation. The solution allows detailed study of the variation of the reflection process as a function of characteristics of the medium without using numerical methods. The solution can also be used as a test for numerical methods of computation of a broader range of problems from the theory of transfer at arbitrary angles of incidence. Analytic expressions are derived for the most probable and average reflection angles. The variation of these angles as functions of thickness of the medium, grazing incidence angle and scattering properties of the medium is studied. Figures 2, tables 2; references: 16 Russian.

[155-6508]

UDC: 551.521.3

VISIBILITY OF SMALL OBJECTS IN TURBID ATMOSPHERE

Moscow IZVESTIYA AKADEMII NAUK SSSR: FIZIKA ATMOSFERY I OKEANA in Russian
Vol 20, No 10, Oct 84 (manuscript received 31 Jan 83, after revision
11 Mar 84) pp 939-946

DROFA, A.S., Experimental Meterology Institute

[Abstract] A study is made of the problem of transfer of the image of a luminous small object through a layer of a polydispersed water aerosol. The influence of the microstructure of the aerosol medium and its distribution along the observation path on the characteristics determining visibility of small objects is studied. Equations are derived for estimation of the visibility characteristics considering these factors. Influence of the microstructure of the aerosol medium and its distribution along the observation path on the visibility characteristics is studied from the standpoint of the theory of linear systems. Figures 2; references 11 Russian.
[155-6508]

UDC: 551.510.42:551.521.32

INFLUENCE OF AEROSOL ON FORMATION OF OUTGOING THERMAL RADIATION

Moscow IZVESTIYA AKADEMII NAUK SSSR: FIZIKA ATMOSFERY I OKEANA in Russian
Vol 20, No 10, Oct 84 (manuscript received 18 Jan 83) pp 947-956

TIMOFEYEV, Yu.M. and OBRAZTZOY, S.P., Leningrad State University

[Abstract] Results are analyzed from calculation of outgoing thermal radiation over a broad spectral range for standard aerosol models recommended by the International Working Group on Radiation Characteristics of the Atmosphere, as well as a number of synthetic models with disturbances based on these standard models. The aerosol is found to influence the brightness temperature by 0.1 - 0.4 K when the atmosphere is clear, up to 2 - 4 K for a turbid atmosphere. Aerosol scattering may contribute up to 5 - 10% to the outgoing thermal radiation at the top level of the terrestrial atmosphere. The use of the total aerosol attenuation coefficient for approximate consideration of the influence of the aerosol does not yield high accuracy in calculating the intensity of outgoing thermal radiation in the atmospheric transparency windows. A second parameter is therefore suggested, characterizing the degree of 'nonblackness' of the atmosphere. A specific expression is suggested for this parameter as a function of the attenuation factor, asymmetry parameter and albedo of single scattering, yielding a computational error of brightness temperature for the aerosol model of the clear atmosphere not over 0.1-0.2K, for a turbid atmosphere - 0.4-0.6 K. Figures 2, tables 2; references 19: 13 Russian, 6 Western.
[155-6508]

UDC: 551.510.41

ONE-DIMENSIONAL NONSTATIONARY MODEL OF PHOTOCHEMICAL TRANSFORMATIONS OF
GAS IMPURITIES IN STRATOSPHERE

Moscow IZVESTIYA AKADEMII NAUK SSSR: FIZIKA ATMOSFERY I OKEANA in Russian
Vol 20, No 10, Oct 84 (manuscript received 28 Apr 83, after revision
20 Apr 84) pp 957-968

KAROL', I.L. and KISELEV, A.A., Main Geophysical Observatory

[Abstract] A one-dimensional photochemical model of the gas composition of the 0-50 km layer of the atmosphere is suggested which differs from many other photochemical models in that it uses seasonally adjusted values of model coefficients and parameters, and also considers the influence of quasi-horizontal transfer between the equator and the poles on the vertical transfer of impurities in the lower stratosphere. A rather long time interval of 15 days and an economical computation scheme allow integration of the system of equations in the model over ten years, sufficient time for analysis and prediction of the effects of increases in human influences on the atmosphere and such natural disturbances as the 11-year solar activity cycle. Primary attention is given to modeling of stratospheric processes. The model generally satisfactorily describes photochemical processes occurring in the stratosphere. It allows the production of mean monthly vertical profiles of the concentration of a number of stratospheric gases which agree with measured data. The calculations show that annual averaging of experimental results with a model with seasonally variable parameters is not consistent with experimental results with a model with mean annual parameters. Figures 6, tables 6; references 10: 5 Russian, 5 Western.
[155-6508]

UDC: 551.463.5:535.51:551.575

SPECIFICS OF POLARIZATION STRUCTURE OF REPEATED SCATTERING BACKGROUND IN
OPTICAL LASER SOUNDING SIGNALS

Moscow IZVESTIYA AKADEMII NAUK SSSR: FIZIKA ATMOSFERY I OKEANA in Russian
Vol 20, No 10, Oct 84 (manuscript received 7 Feb 83, after revision 26 Jul 83)
pp 969-974

KREKOV, G.M. and KREKOVA, M.M., Atmospheric Optics Institute, Siberian Department,
USSR Academy of Sciences

[Abstract] The possibilities of polarization analysis in the interpretation of laser sounding signals are widely known. The Monte Carlo method has been developed as applicable to the solution of this class of problems. This article presents calculation examples related to a mathematical model of a laser direction and ranging (ladar) device operating at $0.6943 \mu\text{m}$, irradiating a cloud layer with a lower boundary at a known height above the ladar

apparatus. It is found that the qualitative nature of depolarization of the multiply scattered background is related primarily to the microphysical nature of the medium, manifested in the behavior of the scattering matrix components, while quantitative changes in $\sigma(\tau)$ depend both on optical density and absorption capacity, as well as the geometric parameters of the ladar system. The qualitative specifics of formation of the polarization structure of the ladar signal described in the article are correct only for a monostatic ladar system. Quantitative prediction of the characteristics of a signal in polarization soundings requires consideration of the boundary conditions which control the specifics of operation of each ladar device. Figures 4; references 8: 6 Russian, 2 Western.

[155-6508]

TERRESTRIAL GEOPHYSICS

GENERAL ASSEMBLY OF EUROPEAN SEISMOLOGIC COMMISSION

Baku VYSHKA in Russian 31 Oct 84 p 4

[Article by F. Kulihev, deputy director of the Azerbaijan Academy of Sciences' Institute of Geology

[Text] The 19th General Assembly of the European Seismologic Commission (ESC) has taken place in Moscow. This commission has been working in more than 20 main directions of seismology, earthquake forecasting and geophysics.

Taking an active part in the work of ESC-84 were Azerbaijan seismologists and geophysicists, who presented 16 papers on all of the main directions of seismology and earthquake forecasting. Particular interest was aroused by papers devoted to the physics of the effect of seismic calm, comprehensive study of the Ismailly earthquakes, a model of the earth's structure with the transition zone in the mantle, long-term forecasting of powerful earthquakes in Azerbaijan, and other topics.

FTD/SNAP
CSO: 1865/129

NEW PUBLICATION REPORTS ON GEOSYSTEMS

Moscow STATSIONARNYYE ISSLEDOVANIYA GEOSISTEM in Russian 1984 (signed to press 10 Jan 84) p 2

[Annotation from book "Study of Geosystems at Experimental Stations", edited by A. M. Grin, Proizvodstvenno-izdatel'skiy kombinat VINITI, 400 copies, 272 pages]

[Text] The book gives reference data and the results of review of the original materials on the research activity of different experimental stations of the USSR carrying out studies of geosystems which may become components of a geosystems monitoring of the country.

It will be of interest for specialists in the field of research, observation, control, forecasting, and management of the environment and nature conservation, for lecturers and students of geographical, biological, hydro-meteorological, and agricultural departments of higher educational institutions.

CSO: 1865/103-E

UDC: 550.343.62

SPECIFICS OF CORRELATION AMONG STRONG CAUCASUS EARTHQUAKES, 1800-1976

Tbilisi SOOBSHCHENIYA AKADEMII NAUK GRUZINSKOY SSR in Russian Vol 113, No 2, Feb 84 (manuscript received 16 Jun 83) pp 305-308

LURSMANASHVILI, O.V., NIKOLADZE, I.Ye. and KACHAKHIDZE, N.K., Geophysics Institute, Tbilisi State University, Georgian Academy of Sciences

[Abstract] A study is presented of the general nature of relationships among strong earthquakes in the Caucasus between 1800 and 1976. Using the hypothesis of interconnection of strong earthquakes by means of plastic waves and assuming that the relationship causes displacement of characteristic points in the R-T plane of distribution of strong earthquakes, bands of earthquake points shown on the graph are taken to be travel-time lines of the slow plastic waves. The graphs show the waves to exist for at least 18-25 years, propagating over distances of at least 600 km. The waves have the capability to initiate strong earthquakes with epicenter separation distances of 140 km. The slow plastic waves maintain constant propagation velocity over the entire period of their existence. Most favorable conditions for repeated earthquakes at the epicenters of previous earthquakes occur at intervals of 18 to 19 years, since after this period the stress caused by solar and lunar tidal forces at the focus of a strong earthquake repeats in direction and magnitude. Figures 3; references: 7 Russian.

[16-6508]

UDC 550.343

SEISMOTECTONIC METHODS FOR SOLVING GENERAL SEISMIC REGIONALIZATION PROBLEMS

Moscow IZVESTIYA AKADEMII NAUK SSSR: FIZIKA ZEMLI in Russian No 4, Apr 84 (manuscript received 12 May 82) pp 3-16

REYSNER, G.I., Earth Physics Institute imeni O. Yu. Shmidt, USSR Academy of Sciences

[Abstract] The author has defined the role of seismotectonic data and methods in discriminating zones of occurrence of anticipated earthquakes with different

magnitude in solving general seismic regionalization is impossible without having information on the tectonic criteria of seismicity; these are defined and classified. The different methods used at the present time in compiling seismic regionalization maps are analyzed and their shortcomings are emphasized. Accordingly, new methods are proposed for defining zones of earthquake occurrence which are based on the defined seismicity criteria. This is followed by presentation of a method for compiling intermediate maps of seismotectonic potential and fault tectonics. As an example of application of the method for compiling a seismotectonic version of a map of zones of the possible occurrence of anticipated earthquakes, the article includes such a map for the territory of Bulgaria which to a considerable degree meets the requirements for general seismic regionalization. Compilation of maps of zones of occurrence of anticipated earthquakes requires preparation of maps of three independent systems: geometrical -- in the form of a complex map of fault tectonics; force -- in the form of a map of seismotectonic potential; spatial distribution of registered earthquake foci. Different variants are possible. Figures 3; references 31: 29 Russian, 2 Western.
[203-5303]

UDC 550.348+550.343.6+550.348.433

LOCALIZATION OF SEISMICITY PRIOR TO UST'-KAMCHATSKIY EARTHQUAKE OF 15 DECEMBER 1971

Moscow IZVESTIYA AKADEMII NAUK SSSR: FIZIKA ZEMLI in Russian No 4, Apr 84
(manuscript received 19 Apr 82) pp 17-24

SOBOLEV, G. A. and ZAV'YALOV, A. D., Earth Physics Institute imeni O. Yu. Shmidt, USSR Academy of Sciences

[Abstract] A study was made of the process of preparation of the Ust'-Kamchatskiy earthquake of 15 December 1971. An algorithm was written for a formalized study of the localization process and its study in time and space. This earthquake occurred at the juncture of the Kuril-Kamchatka and Aleutian island arcs. The event was accompanied by a large number of aftershocks during 1972. The spatial distribution of these aftershocks suggested that the earthquake was associated with a system of two faults running along the strikes of the Kuril-Kamchatka and Aleutian structures. The focal zones extend 75-80 km in both directions. The analysis was based on data from the catalogue for earthquakes of Kamchatka and the Komandorskiye Islands (1962-1980). The algorithm used is described. In some limited volume a "cloud" of N points (earthquake hypocenters) was found with the coordinates X_i, Y_i, Z_i . In this "cloud" a search was made for the plane $\alpha X + \beta Y + \gamma Z - \rho = 0$ under the conditions $\alpha^2 + \beta^2 + \gamma^2 = 1$ and

$$F(\alpha, \beta, \gamma, \rho) = \sum_{i=1}^N [(\alpha X_i + \beta Y_i + \gamma Z_i) - \rho]^2 = \min,$$

where α, β, γ are the direction cosines of the vector normal to the sought-for plane, ρ is the distance from the origin of coordinates to the plane. The

expression in parentheses is the projection of the radius-vector of the i -th point of the cloud (earthquake hypocenter) onto the normal to the plane. It was demonstrated that both nodal planes of this strong earthquake were prepared by faults of lesser magnitude primarily by the 1969 swarm. On the basis of these and other data it was possible to propose a generalized model of the seismic regime in a region of preparation of a strong earthquake which includes localization of swarm activity, seismic calm, foreshocks and aftershocks. Figures 5, tables 1; references 17: 12 Russian, 5 Western.
[203-5303]

UDC 550.344

DEPENDENCE OF SPECTRA OF SEISMIC LONGITUDINAL AND EXCHANGE WAVES ON ENERGY OF UNDERGROUND SHOT

Moscow IZVESTIYA AKADEMII NAUK SSSR: FIZIKA ZEMLI in Russian No 4, Apr 84
(manuscript received 5 Apr 82) pp 25-35

KONDRAT'YEV, Yu. V., DARAGAN, S. K., LYUKE, Ye. I. and PEREGONTSEVA, V. Ye.,
Earth Physics Institute imeni O. Yu. Shmidt, USSR Academy of Sciences

[Abstract] The possibility of describing seismic waves emanating from unvented underground shots on the basis of a model of a source of the center of expansion type was investigated in relation to prediction of the seismic effect of detonation of a powerful shot by using a preliminary model shot. The shots were set off in a region with complex geological conditions. Three shots were placed in a borehole with a diameter of 82 cm (1,880 kg at a depth of 175 m; 2,000 kg at 118 m; 2,000 kg at 102 m). Seismic waves were registered at distances 5.5-90 km from the borehole; the X- and Z-components of ground movement were registered. It was found that in the range from 0.5 to 15 Hz the spectra of P and S waves are reproduced in the region of the maxima with an accuracy to 15-20% and in the range 2-5 Hz (of the greatest interest with respect to seismic safety), with an accuracy to 10%. In the model shots and high-power shots the relationships of the experimental spectra of the P wave at a given distance from the shot site in the frequency range 0.5-15 Hz in general correspond to the ratio of spectra of sources of the center of expansion type. Similar relationships of the experimental spectra of the S-wave in general also correspond to the ratio of spectra of sources of the center of expansion type. These data are evidence of the predominantly exchange origin of the S wave during powerful shots and the possibility of a rough estimate of its parameters using model shots of a relatively low power using the same method as for a longitudinal shot wave. Figures 6; references 9: 7 Russian, 2 Western.

[203-5303]

UDC 550.834.3

INTERPRETING REFRACTED WAVES METHOD DATA ON BASIS OF AUTOMATED DETERMINATION
OF SEISMIC DRIFT

Moscow IZVESTIYA AKADEMII NAUK SSSR: FIZIKA ZEMLI in Russian No 4, Apr 84
(manuscript received 4 Jul 82) pp 36-45

LYAKHOVITSKIY, F. M. and SHAPIRO, S. A., Geology Faculty, Moscow State
University

[Abstract] The automated processing of refracted waves method data from study of the upper part of the section is discussed with emphasis on allowance for the considerable lateral variability of seismic velocities. After review of earlier work done in this direction, the article discusses such work done in the Department of Seismometry and Geoacoustics, Geology Faculty, Moscow State University in developing a set of programs for computer processing of such data, incorporated in the OFSET algorithm and program. The model used has a single refracting boundary having the form of a slightly undulating curve with no slopes exceeding 20° ; the boundary is extremely sharp. Composite counter travel-time curves of refracted waves $t(x)$ and $\bar{t}(x)$ were obtained which constituted the initial material for interpretation. In the interpretation use was made of the nonrigorous representations of the time delays method. The OFSET program is outlined and examples of its application are given. Special features of the algorithm include automated determination of a number of statistical characteristics of travel-time curves for estimating seismic drift, separate analysis of relief and velocity characteristics of travel-time curves and conversion from an evaluation of the mean drift and the mean velocity for the entire profile to determination of integral drift and mean velocity values. It was found that the program is effective in constructing refracting boundaries of a complex form and discriminating velocity contacts. A combination of this method with an analysis of travel-time curves of the first arrivals and borehole observations should facilitate solution of such problems as determination of static corrections in surface sectors of high-velocity rocks, detection of underground voids, karst, ore bodies, buried peat bogs and in study of anisotropy of velocities. It is necessary that a sharp refracting boundary be present for use of the OFSET algorithm; the method is inapplicable for a strictly homogeneous-layered medium with plane boundaries. Figures 4; references 17: 11 Russian, 6 Western.

[203-5303]

UDC 528.27

INFLUENCE OF NONUNIFORMITY OF GRAVITY FIELD IN ROOMS ON RESULTS OF GRAVITY EXPERIMENTS

Moscow IZVESTIYA AKADEMII NAUK SSSR: FIZIKA ZEMLI in Russian No 4, Apr 84
(manuscript received 18 May 83) pp 46-59

SAGITOV, M. U., State Astronomical Institute imeni P. K. Shternberg

[Abstract] In an earlier article (IZV. AN SSSR: FIZIKA ZEMLI, No 3, pp 41-49, 1984) the author examined nonuniformity of the gravity field of a room and analyzed its influence on the results of determination of the Cavendish gravitational constant G and absolute gravity g_0 , since this influence must be taken into account in highly precise pendulum gravity determinations. This article essentially represents a continuation of the earlier work, emphasizing development of the theory of gravity experiments carried out in recent years in the United States, France and the USSR, taking into account the influence exerted on their results by nonuniformity of the local gravity field (inadequate attention has been given to this in the past, and in particular, the second vertical gravity gradient $\partial^2 g / \partial z^2$ has been neglected). Formulas are proposed for taking these influences into account and the possible values of the corrections are estimated. The computations and analysis revealed that the corrections, in the case of a relatively small nonuniformity of the gravitational field in a room, attain considerable values exceeding the present-day accuracy in measuring G . Such a field nonuniformity in the room exerts an appreciable influence on the results of both g and G . Corrections are possible if the distribution of the field of second and third gravity field derivatives for the room is known. Figures 4, tables 3; references 7: 5 Russian, 2 Western.

[203-5303]

UDC 550.83

ELECTROMAGNETIC FIELDS MIGRATION METHOD

Moscow IZVESTIYA AKADEMII NAUK SSSR: FIZIKA ZEMLI in Russian No 4, Apr 84
(manuscript received 8 Apr 83) pp 60-74

ZHDANOV, M. S. and FRENKEL', M.A., Terrestrial Magnetism, Ionosphere and Radio Wave Propagation Institute, USSR Academy of Sciences

[Abstract] The authors have developed a theory of analytical continuation of nonstationary electromagnetic fields into a conducting earth and have formulated the fundamental principles of so-called "reversed" field continuation. This method was recently outlined at the Sixth Workshop on EM-Induction in the Earth and Moon, Univ. of Victoria, 1982 in a paper entitled: "The Solution of Inverse Problems on the Basis of the Analytical Continuation of the Transient EM-Field in Reverse Time." This constitutes a generalization

of known methods for the reverse continuation of wave fields ("seismic migration" method) for the case of variable electromagnetic fields, which is widely used in solving inverse seismic problems. This article gives an analysis of the properties of the "reversed" continuation of the electromagnetic field and the possibility of using electromagnetic migration for solving inverse problems in geoelectrics. The following sections are included: Integral Stratton-Chu Formulas for Nonstationary Field; Integrals of the Stratton-Chu Type for Nonstationary Field; "Reversed" Continuation of Nonstationary Electromagnetic Field; Electromagnetic Field Migration; "Pseudo-migration" Field; Properties of Electromagnetic Migration; Migration of Model Electromagnetic Fields. The theoretical and experimental materials given in the article show that electromagnetic field migration can be used effectively in solving the geoelectric problem, making it possible to retrieve the "geoelectric image" of the medium. It is demonstrated that procedures involved in migration of the nonstationary electromagnetic field correctly conform to Tikhonov principles; numerical calculations are simple; the method is valid for nonstationary fields of both artificial and natural origin; in pin-pointing a deep inhomogeneity and determining its configuration it is necessary to have information only on the electromagnetic field observed at the earth's surface and on the conductivity of a normal section. Figures 9; references 10: 7 Russian, 3 Western.

[203-5303]

UDC 550.385+550.375:550.837

INTERPRETATION OF DIRECTIONAL MAGNETOTELLURIC SOUNDINGS BY ANALYTICAL CONTINUATION METHOD

Moscow IZVESTIYA AKADEMII NAUK SSSR: FIZIKA ZEMLI in Russian No 4, Apr 84
(manuscript received 22 Nov 82) pp 75-82

CHETAYEV, D. N., OS'MAKOV, A. N., MATVEICHEV, M. V. and CHERNYSHEV, A. K.,
Earth Physics Institute imeni O. Yu. Shmidt, USSR Academy of Sciences

[Abstract] Directional magnetotelluric soundings constitute a natural development of the magnetotelluric method. A new mathematical model of the magnetotelluric field has been formulated which retains the Tikhonov assumption of the possibility of its description by a plane wave. Horizontal propagation is taken into account by the assumption that the wave can be nonuniform. The possibility of presence of partial waves of the electric field with a non-zero vertical component of the electric field E_z is allowed. The directional analysis of magnetotelluric observations was developed for determining the earlier unknown directions and phase velocity and spatial attenuation of horizontal propagation. As proposed earlier (V. A. Morgunov, et al., PROBLEMY MATEMATICHESKOY FIZIKI I VYCHISLITEL'NOY MATEMATIKI, Moscow, pp 225-238, 1977), the rejection of the earlier assumption of plane polarization of partial fields made it possible to examine any observed six-component quasimonochromatic field on an individual geomagnetic pulsation as a field on the surface of a horizontally layered half-space. Since the compatibility

of theory and reality could be determined only experimentally, the theory was tested against work carried out on the Ukrainian crystalline shield in 1974. Synchronous observations of the fields of geomagnetic pulsations were made at three registry points selected in such a way that the medium was homogeneous in horizontal directions. Even the very smallest details of the new model were found to agree with experimental data with respect to the spatial-temporal and amplitude-phase structure of the surface field of geomagnetic pulsations. A significant dependence of partial impedances on the characteristics of horizontal propagation of individual geomagnetic pulsations was discovered. This effect makes it necessary to take into account the characteristics of the horizontal propagation of the field using the new method of directional magnetotelluric soundings and makes possible a geological-geophysical interpretation of a horizontally layered section by the successive determination of resistivity and layer thicknesses. Figures 5, tables 3; references 17: 16 Russian, 1 Western.
[203-5303]

UDC 550.34.016

CHARACTERISTICS OF STRONG SHALLOW-FOCUS EARTHQUAKES IN TAJIKSTAN

Moscow IZVESTIYA AKADEMII NAUK SSSR: FIZIKA ZEMLI in Russian No 4, Apr 84
(manuscript received 12 May 83) pp 83-89

ZAPOL'SKIY, K. K. and LOGINOV, G. M., Earth Physics Institute imeni O. Yu. Schmidt, USSR Academy of Sciences

[Abstract] The Gissaro-Kokshaal' fault, which intersects the whole of Tajikistan, divides it into two major tectonic regions: in the north -- the Southern Tien Shan, to the south (on the west) the Tajik depression and (on the east) the Northern Pamir. The objective of this study was a determination of the spectral and temporal characteristics of focal radiations of P-waves for earthquakes from different seismogenic zones in Tajikstan. The existence of such peculiarities could be related to substantially different strength properties of the medium in which the focal volumes of shallow earthquakes in the Southern Tien Shan and Tajik depression occur. Figure 1 is a map of earthquake epicenters; Fig. 2 is a graph of the dependence of the period of shallow earthquakes on magnitude; Fig. 3 shows spectra of strong earthquakes; Fig. 4 illustrates the mean frequency-time fields of P-waves. Data for 32 shallow-focus earthquakes with a magnitude from 4 to 7.3 were analyzed. The observation stations were situated at epicentral distances $\sim 30^\circ$. The collected data show that the earthquakes of the Southern Tien Shan and Northern Pamir differ from the earthquakes of the Tajik depression and Northern Afghanistan with respect to the spectral and time parameters of focal P-radiations. The results obtained in this study have a wider applicability because they make it possible to evaluate one of the reasons for the scattering of experimental data in the study of the dependence of any focal characteristics on M on the basis of seismic observations. Figures 5, tables 2; references 14: 12 Russian, 2 Western.
[203-5303]

UDC 550.834

DETERMINING GEOMETRICAL DIVERGENCE USING SEISMIC OBSERVATION DATA

Moscow IZVESTIYA AKADEMII NAUK SSSR: FIZIKA ZEMLI in Russian No 4, Apr 84
(manuscript received 12 Oct 81) pp 90-93

AVERBUKH, A. G. and DYATLOVSKIY, Yu. A., Central Geophysical Expedition,
Ministry of the Petroleum Industry

[Abstract] In geometrical seismics the total geometrical divergence is used in characterizing the influence of changes in the area of the wave front on the amplitude of oscillations. This article gives an analytical solution of the problem of determining total geometrical divergence on the basis of seismic observation data. Medium structure is considered a priori unknown. The travel-time curves of the waves and the position of sources of oscillations are stipulated. In such a formulation the problem can be called the inverse problem of determination of geometrical divergence. (A solution of the direct problem has already been published.) Until now there have been only special solutions for refracted waves in the case of an axisymmetric medium and for reflected waves in the case of observations at the source. A solution is found for a model representing an elastic layered half-space with an arbitrary configuration of the boundaries and distribution of sources but such that the principles of geometrical seismics are satisfied and the wave fronts do not have self-intersections. It is assumed that the point sources and receivers are situated on the horizontal surface of the half-space and from the times of wave registry it is necessary to determine the divergence value at some reception point j with excitation of oscillations at the point i . In this formulation the problem is solved and illustrated in an example. Figures 1; references 5: 4 Russian, 1 Western.

[203-5303]

UDC: 550.341

SEISMIC ACTIVITY AND MAXIMUM POSSIBLE EARTHQUAKES IN ARMENIAN SSR AND ADJACENT REGIONS

Yerevan DOKLADY AKADEMII NAUK ARMYANSKOY SSR in Russian Vol 78, No 3, 1984
pp 137-140

ASLANYAN, S. R., KIRAKOSYAN, A. A. and NAZARETYAN, S. N., Order of the Red Banner of Labor, Geophysics and Seismology Engineering Institute, Armenian Academy of Sciences

[Abstract] More accurate data on Armenian earthquakes accumulated over the past 8 to 10 years have allowed the authors to construct maps of seismic activity A and maximum possible earthquakes K_{\max} for Armenia. The maps were constructed in isolines with a circular grid. A relatively large area of activity is seen around the Vaspurakan Mountains, with several isolated maxima.

The map of maximum possible earthquakes was prepared using 1962-1980 data and new equations relating the energies of strong earthquakes and mean seismic activity in the area around the epicenter. The data indicate that for the Armenian SSR and adjacent regions the maximum possible earthquake has a Soviet energy rating of K_{max} = 16. This agrees with historical records. Figures 2; references: 5 Russian.

[4-6508]

UDC: 553.98:550.812:551.73(470.46)

SELECTION OF AREAS FOR PROSPECTING OPERATIONS IN SUBSALT DEPOSITS OF SOUTH-WESTERN CASPIAN DEPRESSION

Moscow GEOLOGIYA NEFTI I GAZA in Russian No 5, May 84 (manuscript received 3 Jun 83) pp 9-14

NEMTSOV, N. I., All-Union Scientific Research Geological Prospecting for Petroleum Institute

[Abstract] The territory in question includes the eastern portion of the Volga and Karasal monoclines. Discovery of even small deposits would be quite significant here. The main prospects for oil and gas in this region are related to Lower Permian and Carboniferous subsalt deposits. The subsalt portion of the cross section penetrated by wells consists mainly of Middle and Upper Carboniferous and Lower Permian deposits. A geological and geophysical cross section of the area is presented. Based on the results of geophysical studies, several prospecting boreholes are recommended: a 5500 m borehole in the arch of the Gryzanovskoye upthrust; a 4700 m borehole in the arch of the Karasal structure, the roof of the Lower Permian carbonaceous deposits, which seismic data indicate to be over 500 m thick; a 6000 m borehole in the arch of the Obil'nenskiy upthrust with carbonaceous deposits having high capacity and good filtration properties; and a 6000 m borehole in the arch of the southern pericline of the Kalmytskiy arch upthrust, combined with further seismic prospecting to map the northern pericline. References: 3 Russian.

[21-6508]

UDC: 551.462.54:550.834(470.43)

PROSPECTS FOR FINDING GRABEN-SHAPED DOWNWARPS IN KUYBYSHEV AREA BASED ON SEISMIC PROSPECTING DATA

Moscow GEOLOGIYA NEFTI I GAZA in Russian No 5, May 84 (manuscript received 23 Aug 83) pp 34-38

ANDREYEV, V. N. and KORYAGIN, V. V., Volga Branch, Geology and Exploitation of Fossil Fuels Institute

[Abstract] Graben-shaped downwarps, in spite of their small size, are promising for oil and gas in the Volga-Urals province. Analysis of geological and geophysical information on a known graben-shaped downwarp in the Kuybyshev area has allowed the formation of a number of methodological recommendations and conclusions concerning the relationship between the morphology of downwarps and the wave pattern they produce on seismograms, allowing selection of criteria and characteristics for locating such depressions on seismic time sections. This article outlines these suggestions and conclusions. Based on this, it is concluded that graben-shaped downwarps are rather common in the Kuybyshev area. Recommendations are given to facilitate the task of finding these downwarps. Figures 3, references: 5 Russian.

[21-6508]

UDC: 550.834

NEW METHODS FOR INTERPRETING SEISMIC TIME FIELDS IN MEDIA WITH VARIABLE VELOCITIES

Moscow VESTNIK MOSKOVSKOGO UNIVERSITETA, SERIYA 4: GEOLOGIYA in Russian No 3, May-Jun 84 (manuscript received 5 Jul 83) pp 83-92

PIYP, V. B.

[Abstract] A new approach is suggested to the interpretation of kinematic wave fields, allowing solution of the problem of considering and determining both vertical and horizontal changes in velocity with various methods of seismic prospecting. Local approximation of a cross section by homogeneous functions can be used to interpret a system of travel-time curves consisting of several pairs of oppositely directed or overlapping curves. The method used is as follows. Each pair of oppositely directed curves is processed separately. The upper portion of the section is constructed by short pairs of curves and is reproduced in greatest detail, while the lower portion of the section is determined using long pairs of curves. The problems were checked using models and actual field materials. The methods and algorithms described here define a new approach to the solution of the inverse problems in geophysics. Figures 5; references: 11 Russian.

[20-6508]

MOST IMPORTANT GEOCHEMICAL BARRIER ZONES IN OCEAN (WITH EXAMPLE OF ATLANTIC OCEAN BASIN)

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA GEOGRAFICHESKAYA in Russian
No 3, May-Jun 84 (manuscript received 17 Sep 80) pp 39-53

YEMEL'YANOV, Ye. M., Atlantic Branch, Oceanology Institute, USSR Academy of Sciences

[Abstract] A list is presented of the major geochemical barrier zones plus a brief description of each one. The concept of the geochemical barrier zone was introduced by A. I. Perel'man to refer to areas with a great decrease in intensity of migration of elements, resulting in a corresponding increase in concentration of elements. The barrier zone is thus a natural boundary, on opposite sides of which are different sedimentation conditions leading to sharp changes in the intensity of migration of certain associations of chemical elements. Both horizontal and vertical barrier zones exist. The significance of barrier zones in sedimento-genesis is variable. Among the horizontal zones the most significant are river-sea, shore-sea, second mechanical zone and divergence zone barriers. Of the vertical zones the most significant are the photosynthesis layer, thermocline, water-bottom layer and "active layer". This work does not discuss the manifestation of the effects of biochemical and geochemical barrier zones under specific conditions. Figures 1, tables 1; references 55: 44 Russian, 11 Western.

[11-6508]

DIAGRAM OF NONSTATIONARY REJOINING OF MAGNETIC FORCE LINES

Moscow GEOMAGNETIZM I AERONOMIYA in Russian Vol 24, No 3, May-Jun 84 (manuscript received 8 Jun 83) pp 448-452

SEMEONOV, V. S., VASIL'YEV, Ye. P. and PUDOVKIN, A. I., Polar Geophysics Institute, Kola Affiliate, USSR Academy of Sciences; Leningrad State University

[Abstract] A qualitative model of rejoining of magnetic lines of force is proposed which may be useful in the interpretation of explosive processes in plasma such as a magnetospheric substorm or solar flare. The term "rejoining" is used to refer to the Petschek mechanism of shock wave formation. The rejoining process is initiated in the current layer. The appearance of a current in the layer due to a sudden change in conductivity leads to the generation of MHD waves, particularly an Alfvén wave, which creates the current flow system. The current layer is split and slow shock waves are formed. This results in spontaneous switching of magnetic force lines. The dimensions of the diffusion area and the occurrence of processes within it do not allow it

to be considered in the magnetohydrodynamic approximation, requiring instead a kinetic approach. The approach is essentially phenomenological. Without studying processes occurring in the diffusion area in detail, the authors assign the currents within the area *a priori*. The system is closed by considering the reverse influence of the convective zone on plasma processes in the diffusion area. The system suggested for the process is based on analysis of asymptotic, precise and numerical solutions from the literature. Figures 4; references 16: 7 Russian, 9 Western.

[12-6508]

UDC: 550.385.26

DIURNAL VARIATIONS IN TERRESTRIAL MAGNETIC FIELD AND STRUCTURE OF MAGNETOSPHERE

Moscow GEOMAGNETIZM I AERONOMIYA in Russian Vol 24, No 3, May-Jun 84 (manuscript received 30 May 83) pp 460-466

AFANAS'YEVA, V. I., Terrestrial Magnetism, Ionosphere and Radio Wave Propagation Institute, USSR Academy of Sciences

[Abstract] The purpose of this study is to show how the basic regularities of diurnal geomagnetic variations are related to the structure of the magnetosphere, to show that a great deal of information on the structure of the magnetosphere can be obtained by comparing the mean characteristics of these S_q variations with known mean values of magnetosphere parameters. The relationship of S_q variations to the structure of the magnetosphere is demonstrated by comparing the boundaries of changes in the signs of S_q variations and boundaries of structural elements of the magnetosphere and radiation belts. The latitude distribution of S_q variations is found to illustrate the change in shape of diurnal variations making up the geomagnetic field vector. The latitudes at which $S_q = 0$ differ for the various components. Analysis of these latitudes indicates that they coincide with or are at least close to structural magnetosphere boundaries. The results presented in this article confirm the relationship of the current system of S_q variations to processes occurring above the ionosphere up to the boundary of the magnetosphere. The latitudes change of sign of $S_q = 0$ depend on the location of dc anomalies, possibly indicating the influence of anomalies on the structure of the magnetosphere. Figures 1, tables 3; references: 9 Russian.

[12-6508]

UDC: 550.386.37

EXCITATION OF GEOMAGNETIC Pcl-2 AND PULSATIONS WITH DECREASING PERIOD DURING MICROSUBSTORMS

Moscow GEOMAGNETIZM I AERONOMIYA in Russian Vol 24, No 3, May-Jun 84
(manuscript received 15 Jul 83) pp 467-471

BARKOVA, Ye. S. and SOLOV'YEV, S. I., Space Research and Aeronomy Institute, Yakutsk Affiliate, Siberian Department, USSR Academy of Sciences

[Abstract] Materials recorded at a chain of stations extending along the auroral zone from Cape Schmidt to Lovozero observatory ($\Delta\lambda \approx 120^\circ$) are used to study conditions of excitation of Pcl-2 pulsations and decreasing-period pulsations during microsubstorms in order to construct a more complete picture of the development of substorms. Observations were conducted during excitation of Pi2 series at Yakutsk station. Possible excitation mechanisms are discussed. Simultaneously with the beginning of a microsubstorm in the noon-evening sector, ionocyclotron instability develops and as a result Pcl-2 pulsations are excited. The reason for the development of the instability may be the injection of protons into the area of the partial ring current directly in this sector or appearance of conditions favorable for development. At the moment of sharp activation of the microsubstorm, electric fields directed to the west are developed or strengthened in a local area of the magnetosphere. The appearance of these fields in the area of development of instability leads to penetration of protons into the magnetosphere, and in turn to an increase in the frequency of radiation and period of Pcl-2 in the pulsations of decreasing period. Figures 4; references 8: 4 Russian, 4 Western.
[12-6508]

UDC: 550.837

DIRECTIONAL ANALYSIS OF WAVE PACKETS OF MAGNETOTELLURIC FIELD

Moscow GEOMAGNETIZM I AERONOMIYA in Russian Vol 24, No 3, May-Jun 84
(manuscript received 12 Apr 83) pp 472-475

SAVIN, M. G., IZRAIL'SKIY, Yu. G. and APLAKOV, R. A., Computer Center, Far Eastern Scientific Center, USSR Academy of Sciences

[Abstract] A new algorithm is suggested for directional analysis of magnetotelluric observations. The method is based on determination of dispersion of the entire wave packet. This directional analysis algorithm allows reliable determination of the characteristics of horizontal propagation of geomagnetic pulsations and the conductivity of the surface layer by a variational method based on analysis of the individual pulsations at a single point. It differs from the classical directional analysis method in that it does not require a priori information on the parameter (upper layer conductivity) for determination of K_x and K_y . Tables 1; references: 4 Russian.
[12-6508]

UDC: 550.383

DYNAMIC SPECTRA OF MEAN MONTHLY VALUES OF GEOMAGNETIC FIELD ELEMENTS BASED ON SPECTRAL-TIME ANALYSIS DATA

Moscow GEOMAGNETIZM I AERONOMIYA in Russian Vol 24, No 3, May-Jun 84
(manuscript received 29 Apr 83) pp 476-481

ASTAPENKO, V. N. and KUZNETSOV, Yu. N., Geochemistry and Geophysics Institute, Belorussian Academy of Sciences

[Abstract] Usually when spectral-time analysis is used to determine the dynamic spectrum $S(t, \omega)$ the initial time series $F(t)$ is centered, a Fourier transform is applied, the spectrum obtained is multiplied by the frequency characteristic of a narrow-band filter, then a reverse Fourier transform is performed on the product. The modulus of the dynamic spectrum is primarily used in the stage of interpretation of the research results. Two methods for determining the dynamic spectrum in the frequency and time areas are discussed. A method suggested for determining dynamic spectra based on a moving window allows the fine spectral-time structure of the geomagnetic field to be studied. Figures 3, tables 1, references 13: 12 Russian, 1 Western.

[12-6508]

UDC: 550.311

LATERAL INHOMOGENEITY OF MANTLE SURFACE IN WESTERN EURASIA

Moscow IZVESTIYA AKADEMII NAUK SSSR: FIZIKA ZEMLI in Russian No 6, Jun 84
(manuscript received 14 Apr 83) pp 21-34

KUNIN, N.Ya. and SHEYKH-ZADE, E. R., USSR Academy of Sciences, Earth Physics Institute imeni O.Yu. Shmidt

[Abstract] An attempt is made to summarize data on the Mohorovicic discontinuity for the region including Europe and adjacent areas best studied by deep soundings. Areas are classified according to the type of data available. Specifically, subclass I-B consists of areas in which point profiling or recordings with long distances between observations on long profiles have been made using powerful explosions. The specifics of lateral changes in boundary velocities at the mantle surface in western Eurasia are described. Each tectonic region is individually analyzed. In the Caspian Depression, deep seismic soundings have shown that the range of variation in the M discontinuity velocity is similar to that of young plates. There is a clear zonality in the lateral distribution of velocities: the eastern portion of the depression is one of high velocities, the central shows normal velocities while the western portion shows low velocities. In the Kazakh folded area the mantle surface has been studied along 3,800 km of first-order profiles. Velocities are generally normal or high, with two maxima on the travel-time

curve, in the southern and northern portions. There is a small zone in the western extremity of Lake Balkhash with low M discontinuity velocities (7.8 km/s). External excitation in an area of sharply differentiated mantle causes increased relative mobility of adjacent dissimilar blocks, resulting in intensive sedimentation within areas of relatively dense and high velocity lithosphere with general subsidence of the basement during the Phanerozoic and Riphean by up to 25 km. This subsidence can occur in areas of differentiated mantle without the development of geosynclical conditions, as for example in the Caspian Depression and in Western Siberia. Figures 6; references 49: 33 Russian, 16 Western.

[14-6508]

UDC: 550.34.016

RANGE OF RECORDING OF EARTHQUAKES IN BAIKAL ZONE BY BOTTOM SEISMIC STATIONS

Moscow IZVESTIYA AKADEMII NAUK SSSR: FIZIKA ZEMLI in Russian No 6, Jun 84
(manuscript received 16 Dec 81) pp 35-43

SOLOV'YEV, S.L., BUKINA, K.I., VILLEMON, L.Kh. and KOVACHEV, S.A.,
Institute of Oceanology imeni P.P. Shirshov, USSR Academy of Sciences;
Earth's Crust Institute

[Abstract] In the summer of 1980, a joint project by the authors' institutes involved combined recording of earthquakes in the Baikal zone with autonomous bottom and shoreline seismic stations. Earthquakes were recorded using autonomous bottom seismic stations manufactured in 1979-1980, modifications of apparatus developed initially at Moscow State University, then improved at the Earth Physics Institute, USSR Academy of Sciences. These stations consist of a three-component cardan-mounted installation converting seismic oscillations to voltages, an amplifier and signal-matching section, eight track magnetic recorder and clock. All of these components are contained in a strong watertight cylindrical stainless steel container. Instruments were placed in the middle, deepest portion of Baikal, among the most seismically active regions in the area. It was found that seismic stations with a gain on the order of 500,000 at the peak frequency of 8 Hz can record earthquakes of Soviet energy level K = 9 at an epicenter distance of up to 600 km. A nomogram is constructed to allow estimation of the maximum range of recording of earthquakes by autonomous bottom seismic stations as a function of the energy class of the earthquake and gain of the station. Figures 5; references 11 Russian.

[14-6508]

UDC: 550.831+550.834:001.8

DETERMINATION OF CRUST AND UPPER MANTLE DENSITY BASED ON DEEP SEISMIC SOUNDING AND GRAVIMETRY DATA. I

Moscow IZVESTIYA AKADEMII NAUK SSSR: FIZIKA ZEMLI in Russian No 6, Jun 84
(manuscript received 29 Apr 83) pp 44-63

STRAKHOV, V.N. and ROMANYUK, T.V., Earth Physics Institute imeni O.Yu. Shmidt, USSR Academy of Sciences

[Abstract] Due to the difficulty of practical combined interpretation of deep seismic sounding data and gravimetry data in three dimensions, this article analyzes a traditional two-dimensional statement of the problem. The method used can be extended to the three-dimensional case. This article is limited to logical analysis of the difficulties arising in combined interpretation of these two data types, assuming density to be a function of velocity, plus formulation of the major methodological statements which must be used to support combined interpretation. A formalized mathematical statement of the problem is presented. The statement is regularized, considering the instability of solution of the inverse problem in gravimetry, and is suitable for automation. It is assumed that true, combined interpretation of deep seismic sounding and gravimetry data can be accomplished only on the basis of multiple version computation with the participation of an expert human interpreter. Figures 5; references 32 Russian.

[14-6508]

UDC: 550.2

RELATIONSHIP BETWEEN SEISMIC STATUS OF EARTH AND RELATIVE POSITION OF BODIES IN SUN-EARTH-MOON SYSTEM

Moscow IZVESTIYA AKADEMII NAUK SSSR: FIZIKA ZEMLI in Russian No 6, Jun 84
(manuscript received 29 Apr 82) pp 95-99

KULANIN, N.V., Earth Physics Institute imeni O.Yu. Shmidt, USSR Academy of Sciences

[Abstract] The time spectrum of variations in seismicity is quite broad. There are seismic seasons, as well as multiannual variations. This article studies the range of characteristic times of variation from days to about one year. Seismic activity as a function of the position of the moon relative to the earth and the direction toward the sun is studied. The moments of strong earthquakes, over 5.8 on the Richter scale, between 1968 and June 1980 are plotted in time coordinates relating them to the relative positions of the three bodies in the sun-earth-moon system. Methods of mathematical statistics are applied to the points produced, indicating at least 99% probability that the distribution was not random. A periodicity of the earth's seismic state of 413 days is observed. Figure 1; references 9: 7 Russian, 2 Western.

[14-6508]

UDC: 551.24:553.98(574-14)

RECENT TECTONICS OF PESCHANOMYSSKO-RAKUSHECHNAYA ZONE

Moscow SOVETSKAYA GEOLOGIYA in Russian No 6, Jun 84 pp 64-71

TIMURZIYEV, A. I., "Mangyshlakneft" Geological Production Association

[Abstract] The recent tectonics and morphostructure of the Peschanomyssko-Rakushechnaya zone were studied in association with the determination of structural-tectonic specifics and oil and gas content of the pre-Jurassic complex of Mangyshlak. The recent stage of tectonic development in this area differs significantly from previous periods of geological history. Results of structural-geomorphological studies allow regionalization of the territory in terms of degree of activity and manifestation of recent tectonic movements. The very young relief in this zone makes morphostructural methods quite promising in the study of the deep structure of the region. The results of the series of studies performed allows determination of the principles of regionalization of the territory with differentiation of regional and local jointing sectors raised to linear weakened zones of recent activation. The concept of "oil- and gas-bearing landscapes" is quite important for Mangyshlak, since deposits of hydrocarbons tend to be found in morphometric anomalies with broken relief and with closely located jointing lines. Figures 4, references: 15 Russian.

[9-6508]

UDC: 551.243(261.24)

FAULTING IN UPPER BALTIC SEA SEDIMENTARY COVER

Moscow SOVETSKAYA GEOLOGIYA in Russian No 6, Jun 84 pp 72-79

SVIRIDOV, N. I., Atlantic Branch, Oceanology Institute, USSR Academy of Sciences

[Abstract] Continuous seismic profiling in the upper pre-Quaternary sedimentary cover down to 200 m depth in the Baltic Sea has revealed many faults -- crushed zones, folds, overthrusts and local downcuts, particularly in Meso-Cenozoic masses. This article analyzes the southeastern region of the sea where these deposits have been well studied in order to determine the nature and mechanism of formation of these faults. Analysis of the geological and geophysical data from the region indicates that surface faults are closely related to the material composition of the rock, tectonic and geomorphological structure of the region. Characteristically they show limited depth of penetration into the sedimentary mass, not over 200 m, a relationship to plastic and mechanically weak rock, a tendency to be located in areas where shallow, rigid reflecting boundaries are found as well as tectonic zones, the slopes of depressions and areas of broken pre-Quaternary relief. Many of the specifics of the faults correspond to glacial dislocations observed on

land and the mechanism of their formation is best explained by glaciotectonics. The Baltic Sea depression, an area of repeated glaciation, is an ideal location for the development of glaciodislocations. Figures 3, references: 15 Russian.

[9-6508]

UDC: 550.836.2:553.3

TEMPERATURE ANOMALIES ABOVE ORE BODIES

Moscow SOVETSKAYA GEOLOGIYA in Russian No 6, Jun 84 pp 113-119

GORNYY, V. I. and YERMOLAYEV-MASLOV, V. B., "Aerogeologiya" Geological Production Association

[Abstract] Temperature anomalies above ore bodies which can be revealed by aerial thermal surveys and field geothermal surveys are related to distortions of the quasisteady thermal field of the earth by ore bodies with heat conductivity differing from their surroundings, exothermal reactions related to oxidation of sulfide ores and distortion of the variable heat field by objects with contrasting thermal properties. Results of geothermal measurements in boreholes at shallow depths are used to analyze the nature of changes in temperatures with depth at an ore deposit on the southern slope of the Caucasus. Temperature anomalies above ore bodies are found to be greatest at very shallow depths (about 1 meter). Variations in albedo above ore deposits result in nonuniform absorption of solar radiation with resulting temperature anomalies. Regular changes in the amplitudes of temperature anomalies with time and depth indicate that they are closely related to external variable heat sources. This significantly expands the capabilities of both aerial and field heat surveys for geological mapping and prospecting. The theory and practical methods of geological interpretation of the results of these surveys must now be developed. Figures 4, references: 11 Russian.

[9-6508]

UDC: 550.832.55

EXPERIMENTAL STUDY OF RESPONSE FUNCTION OF SCINTILLATION DETECTOR FOR GAMMA-GAMMA-LOGGING SPECTRA

Leningrad VESTNIK LENINGRADSKOGO UNIVERSITETA: GEOLOGIYA, GEOGRAFIYA in Russian No 12, Issue 3, Jun 84 (manuscript received 29 Dec 83) pp 42-48

MEYER, A. V.

[Abstract] For media with an effective atomic number of 12 to 14, the contribution of the response function of the detector to the soft component of the spectrum at 50 to 100 KeV can be approximately determined from the counting

rate in the 20 to 60 KeV range, which can increase response and accuracy of spectral gamma-gamma-logging. However, the shape and structure of the response function have not been studied. This article presents an experimental study of this subject. The essence of the method was measurement of the spectral counting rates with successively increasing filter thickness between the medium studied and the detector, with construction of attenuation curves at a logarithmic scale and their expansion to monoenergetic exponential curves characterizing the various spectral components. The contribution of the response function to the low-energy range of the scattered gamma-radiation spectrum for media with an effective atomic number 13 is 30 to 40%, while for media with larger effective atomic numbers, such as rich ore, it may reach 60%. The contribution of the response function varies little for scintillators with different volumes. The selection of detector size is therefore not critical and is determined primarily by the necessary statistical accuracy of registry of the hard component. Figures 3, tables 1; references 7: 5 Russian, 2 Western.

[10-6508]

UDC: 550.348

STUDY OF EARTHQUAKE PREPARATION PROCESSES FROM DISTRIBUTION OF WEAK TREMOR EPICENTERS

Kiev GEOFIZICHESKIY ZHURNAL in Russian Vol 6, No 4, Jul-Aug 84 (manuscript received 11 Jan 84) pp 44-52

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[Abstract] A method has been developed for determining regions where earthquakes represent a potential danger using information distributed in space and time in the area where the earthquake focus is prepared. Quantitative dependences have been obtained between earthquake parameters and the preparation characteristics. The sensitivity of a characteristic is also considered. One of the characteristics of earthquake preparation is a change in the parameters of weak tremors in the area adjacent to the epicenter of a future major shock. It has been established that the epicenters of weak earthquakes show a tendency to move away from, then gradually move toward the epicenter of the major (strong) tremor. The stronger the major tremor, the greater the distance by which the epicenters of weaker tremors move away from it and the greater the time between the maximum distance and the moment of the major tremor. Scanning of the history of an area to seek locations toward which the epicenters of series of minor tremors are tending was found to be effective in predicting regions of earthquakes, but not as yet in predicting exact locations and magnitudes. Figures 5; references: 7 Russian.

[26-6508]

UDC: 550.834.5

GEOLOGICAL INFORMATION CONTENT OF REFLECTED WAVE RECORD FORM

Kiev GEOFIZICHESKIY ZHURNAL in Russian Vol 6, No 4, Jul-Aug 84 (manuscript received 5 Sep 83) pp 52-59

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[Abstract] A study is made of a method which utilizes the recorded form of reflected waves to determine the lithologic composition of the rock in a geological cross section. The form of the record can be used to predict the material composition of an object only if the internal structure of the object exerts the predominant influence on its characteristics and the signal-to-noise ratio is at least 10 to 1. The specifics of formation of waves are studied for 7 thin-layer models characteristic for terrigenous and carbonaceous sediment accumulation in order to clarify the relationship between the details of the recorded form and the structure of the reflected wave groups. Experimental materials are used to show that a stable solution of the inverse problem can be achieved by using methods of pattern recognition to establish the information content of the various characteristics of reflected wave record forms. The method can be used to predict the structure and composition of objects in various geological situations. Figures 3, tables 1; references: 15 Russian.

[26-6508]

UDC: 550.834.5:62.50

POSSIBILITY OF RETRIEVING DYNAMICS OF REFLECTED WAVE METHOD RECORDS BENEATH LOW-VELOCITY ZONE

Kiev GEOFIZICHESKIY ZHURNAL in Russian Vol 6, No 4, Jul-Aug 84 (manuscript received 21 Jun 83) pp 59-71

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[Abstract] A study is made of transformation of reflected wave method records beneath the base of the low-velocity zone, using the theory of migration of wave fields or inverted wave continuations, allowing the boundaries of adequacy of the linear low-velocity zone model to be determined in the space of its characteristics. The problem is reduced to one of reverse filtration. One significant difference of this reverse filtration from formal algorithms is that the desired output function is less defined. Principles of the theory of self-organization of mathematical models can be applied. The result of this processing is a continuation of the reflected wave records beneath the base of the low-velocity zone, as well as refinement of the physical model of the zone itself, increasing the effectiveness of the method. Figures 4, tables 1; references 19: 18 Russian, 1 Western.

[26-6508]

UDC: 550.834.32

VELOCITY MODEL OF CRUST ALONG VINNITSA-MANEVICI PROFILE ON UKRAINIAN SHIELD

Kiev GEOFIZICHESKIY ZHURNAL in Russian Vol 6, No 4, Jul-Aug 84 (manuscript received 29 Dec 83) pp 78-83

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[Abstract] Deep seismic soundings along the Vinnitsa-Manevichi profile were made in 1981-1982 by the continuous profiling method. The wave pattern recorded was typical in qualitative respects for the Ukrainian shield. There are no waves from the thin sedimentary cover. The first arrivals are a refracted wave form in the upper part of the consolidated crust, followed by alternating crustal reflected waves. At a distance of 220-230 km the first arrivals include the head wave from the Moho, then reflected waves from boundaries in the upper mantle. Diffracted waves are recorded sporadically. Analysis of the results has allowed differentiation of the lower crust into four blocks, the stratal velocity in each of which differs from neighboring sections. Figures 4; references 5 Russian.

[26-6508]

UDC: 550.834.5

RESULTS OF STUDIES OF WAVE FIELD INTERNAL STRUCTURE IN PREDICTION OF GEOLOGICAL CROSS SECTION

Kiev GEOFIZICHESKIY ZHURNAL in Russian Vol 6, No 4, Jul-Aug 84 (manuscript received 15 Jul 83) pp 83-88

TELEPNEV, G. F. and KOVALEV, V. P., "Ukrgeofizika" Production Association

[Abstract] New experimental and theoretical data have been accumulated in the area of the theory of wave field formation. The study of mechanisms of wave field formation using an object which has been drilled and seismically observed can be fruitful if the signal-to-noise ratio at the output of the seismic recording channel is maximized. This allows the wave field to be resolved into elementary waves and their parameters determined. An adequate mathematical model can be constructed using probabilistic-deterministic theory. The most convenient model, considering both deterministic and statistical properties of the seismic signals, is the parametric linear prediction model with time-variable parameters. The input of the linear system is a quasiperiodic sequence of pulses within the limits of reflecting horizons and a random sequence in intermediate intervals. Studies of this type were undertaken under various seismogeological conditions. Results from a profile in the southeastern portion of the Bogatoyskaya depression, where two prospecting boreholes are located, are studied as an example. It is found that the actual medium has thin strata, which is reflected in the seismic wave field. The wave field consists of the sum of elementary waves

including multiple waves formed at various levels of acoustical differentiation. The parameters of the elementary waves are determined by the physical characteristics of the cross section. The study of problems of prediction of the geological structure remains beyond the capacity of the method due to the ambiguity of the results of interpretation of the integral parameters. Figures 3; references 7: 5 Russian, 2 Western.
[26-6508]

UDC: 551.235+551.21

GIGANTIC AVALANCHES ON VOLCANOES

Moscow VULKANOLOGIYA I SEYSMOLOGIYA in Russian No 4, Jul-Aug 84 (manuscript received 20 Apr 83) pp 14-23

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[Abstract] Gigantic and catastrophic collapses and avalanches involving over 0.05-0.1 km³ of earth have been common in the recent history of active volcanoes, including the immense 2.8 km³ event associated with the eruption of Mount St. Helens on 18 May 1980. Conditions favorable for broad development of avalanches include great elevation, extensive development of steep V-shaped valleys down the sides, a dense network of circular and radial volcanic-tectonic fractures, abundance of noncohesive clay rock, and generally high seismicity. On Kamchatka and in the Kuril Islands alone, the results of more than 100 such avalanches can be seen. They occur both during eruptions and on dormant volcanoes. They represent a danger, since they occur suddenly and travel at very high speeds. They may cause tsunamis if they occur on volcanoes located on the seacoast. A number of volcanoes potentially dangerous in this respect are found on Kamchatka and in the Kuril Islands. Avalanches are quite probable at Klyuchevskiy, Kizimene and Mutnovskiy volcanoes. Figures 5, tables 1; references 15: 7 Russian, 8 Western.
[36-6508]

UDC: 551.23

HYDROTHERMALLY ALTERED BASALTS OF WESTERN UZON CALDERA FIELD (KAMCHATKA)

Moscow VULKANOLOGIYA I SEYSMOLOGIYA in Russian No 4, Jul-Aug 84 (manuscript received 6 Sep 82) pp 32-49

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[Abstract] A study was made of hydrothermal changes of basalts in the western thermal field of Uzon caldera on Kamchatka. The thermal field consists of allochthonic lumps of basalts of the Middle Pleistocene stratovokano Uzon, petrographically and petrochemically related to plagiophyre high-alumina varieties characteristic for acute-arc volcanism. The western thermal field is a good example illustrating the effect of various waters on rocks of various composition and genesis. Simultaneous migration of subalkaline and acidic solutions occurs in the basalt section under certain conditions. Ascending secondary steam flows condense to form subalkaline solutions. Their interaction with surrounding rocks forms chlorite montmonillonite associations of clay minerals. Kaolinite is formed in the area exposed to acid solutions. The complex hydrochemical situation leads to significant differentiation of the chemical composition of the basalts. Mixed layered kaolinite-montmonillonite and montmonillonite-kaolinites have been described in other areas. The composition of the secondary minerals distinguishes the theory from hydrothermally altered basalts which develop under oceanic underwater conditions. Figures 5, tables 4; references 31: 22 Russian, 9 Western. [36-6508]

UDC: 551.242.22:551.21

NEW CONCEPTS OF TECTONICS AND VOLCANISM IN EASTERN KAMCHATKA

Moscow VULKANOLOGIYA I SEYSMOLOGIYA in Russian No 4, Jul-Aug 84 (manuscript received 2 Dec 82) pp 50-66

YERMAKOV, V. A., TSIKUNOV, A. G. (deceased) and CHERNYKH, Ye. N., Earth Physics Institute, USSR Academy of Sciences

[Abstract] A discussion is presented on the structural origin of volcanism in eastern Kamchatka in the example of a volcanic region limited on the south and west by the Zhupanov river and its upper tributaries. The specifics of this volcanic region include broad development of caldera volcanoes, a large volume of acid rock and ignimbrites, and high thermal activity of the volcanoes. It is located within a slowly rising (or stagnant) structure along the intensively rising Valaginskiy ridge. The Zhupanov depression influences the location of volcanoes and the composition of their rocks. The depression was formed in Oligocene-Miocene times. Tectonic movement in the Middle to

Late Miocene was intensive and the structure began to rise. Recent eastern Kamchatka volcanism thus occurs under conditions of general slow synchronous upthrusting. Volcanism in eastern Kamchatka began in the Early Pliocene and continued throughout the Pliocene-Pleistocene, increasing constantly to the present day. Recent volcanism began in the Early Pliocene, Quaternary volcanism representing only a portion of the Pliocene-Quaternary structural stage. Figures 4, tables 2; references: 33 Russian.
[36-6508]

UDC: 528.481+551:241+551.21

STUDY OF DEFORMATION OF THE EARTH'S SURFACE ON KLYUCHEVSKIY VOLCANO (1978-1982)

Moscow VULKANOLOGIYA I SEYSMOLOGIYA in Russian No 4, Jul-Aug 84 (manuscript received 13 Jun 83) pp 67-75

ZHARINOV, N. A., ENMAN, V. B., SKURIDIN, Yu. F. (deceased), YEREMEYEV, N. N. and LOKOTKO, M. I., Volcanology Institute, Far Eastern Scientific Center, USSR Academy of Sciences; Earth Physics Institute, USSR Academy of Sciences

[Abstract] Between the fall of 1978 and 1982 high-precision measurements of the location of the surface of the earth were made on Klyuchevskiy volcano. Measurements included linear measurements, operations at reference leveling areas, a large-scale leveling profile along a radius of the volcano and slope measurement observations. The geodetic measurement field includes an area of about 500 square kilometers. As a result of the high-precision measurements performed, compressive deformations were observed between 1978 and 1980, reaching $6.6 \cdot 10^{-6}$ in magnitude and resulting from a decrease in pressure in the intermediate focus of the Klyuchevskiy volcano during the peak eruption in 1978-1979 and the side eruption of 1980. Vertical movements decreasing in magnitude with increasing distance from the central crater were observed on the radial profile. The amplitude of the movement over 3 years reached 10 cm. The nature of movement along the profile indicated a general rise in the slope of the volcano in 1979-1982 before the side eruption of March 1983. Slope measurement observations 13 km from the crater at the peak indicate a constant slope component. Figures 7; references: 8 Russian.

[36-6508]

UDC: 550.344.094.43

CODA-WAVE CHARACTERISTIC ANOMALIES OF WEAK EARTHQUAKES BEFORE THREE STRONG EARTHQUAKES IN KURIL-KAMCHATKA AREA

Moscow VULKANOLOGIYA I SEYSMOLOGIYA in Russian No 4, Jul-Aug 84 (manuscript received 27 Apr 83) pp 76-90

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[Abstract] This article reports on a study to test for the presence of detectable anomalies preceding strong earthquakes. It is demonstrated that variations in envelope shape are characteristic for strong Kuril-Kamchatka earthquakes. An estimate is obtained of the time and amplitude characteristics of the phenomenon. The presence of precursor variations in coda-wave frequency composition is also demonstrated. The probable causes of the anomalies are variations in absorption in the medium. The precursor consists of an increase in the steepness of the coda-wave envelope, observed for three strong earthquakes. The precursor is rather unique: approximately 1 year before an earthquake the α parameter suddenly drops from 0 to -0.0015-0.0025 and remains at this level until the moment of the earthquake, after which it increases to 0 over a period of 1 or 2 years. This anomaly is statistically quite reliable and can be determined on the basis of data accumulated over a period of 2 to 4 months. Figures 11, tables 3; references 9: 7 Russian, 2 Western.

[36-6508]

UDC: 550.341.4

PROCESS AT FOCUS OF PETROPAVLOVSK EARTHQUAKE 24 NOVEMBER 1971

Moscow VULKANOLOGIYA I SEYSMOLOGIYA in Russian No 4, Jul-Aug 84 (manuscript received 10 Sep 82) pp 91-103

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[Abstract] An analysis is presented of processes at the focus of the Petropavlovsk earthquake of 24 November 1971 based on data on P waves which were studied during the earthquake. The initial materials for the study were records of the earthquake for regional seismic stations of the Kamchatka network, plus microfilms of seismograms from the American WWSS network. The focal mechanism was constructed by the usual methods. The process of development of repeated displacements at the focus of the earthquake is studied and estimates of the rate of propagation of discontinuities are presented. Azimuthal specifics of P-wave spectra are reported. A Doppler effect is noted. Figures 7, tables 4; references 16: 9 Russian, 7 Western.

[36-6508]

UDC: 551.241(265.3)

TECTONIC RECONSTRUCTION OF CONDITIONS OF FORMATION OF SEDIMENTARY COVER IN
SEA OF JAPAN BASIN BASED ON SEISMIC PROSPECTING DATA

Moscow BYULLEHEN' MOSKOVSKOGO OБSHCHESTVA ISPYTATELEY PRIRODY: OTDEL
GEOLOGICHESKIY in Russian Vol 59, No 4, Jul-Aug 84 (manuscript received
28 Oct 82) pp 75-79

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[Abstract] Seismic prospecting materials from the Sea of Japan distinguish between the acoustical basement and sedimentary cover. Only the surface parameters of the acoustical basement can be utilized at present in tectonic reconstruction. The sedimentary cover overlies the acoustical basement and has been analyzed by dredging operations as well as acoustical studies. The study of seismic time sections has established several types of bedding of strata in the sedimentary cover. Cosedimentation changes in the thickness of sedimentary layers are characteristic for shallow epicontinental basins, where the thickness of the cover depends on the magnitude of tectonic movements. Fluctuations in sea level influence the formation of gaps within the sedimentary cover. The history of development of the sedimentary cover of the Sea of Japan floor is reconstructed over the surface of the acoustical basement. Figures 1; references 13: 4 Russian, 9 Western.

[19-6508]

UDC: 551/72:551.24(470.117)

STRATIGRAPHY AND TECTONIC POSITION OF ANCIENT DEPOSITS ON SOUTH ISLAND OF
NOVAYA ZEMLYA

Moscow BYULLEHEN' MOSKOVSKOGO OБSHCHESTVA ISPYTATELEY PRIRODY: OTDEL
GEOLOGICHESKIY in Russian Vol 59, No 4, Jul-Aug 84 (manuscript received 12 Oct
82) pp 80-88

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[Abstract] In recent years medium-scale geological mapping by the authors has produced new data on the internal structure, stratigraphy and age of the ancient deposits of southern Novaya Zemlya. Four lithologic masses have been distinguished and their areas of occurrence mapped. The stratigraphic sequence of these classes has been established, confirmed by fossil analysis. This article analyzes the lower structural level, consisting of terrigenous formations. Outcroppings of individual masses are irregular, near isometric in plan. They include complex folded dislocations formed of a combination of sublatitudinal and northwesterly strike structures which intersect each other. The sublatitudinal folds correspond to the direction of dislocation of the ancient formations; the northwesterly structures coincide with the

strike of upper-level structures, consisting of Paleozoic deposits. The ancient masses form the independent Baikal, system, separate from the overlying Caledonian-Hercynian structures. The age of the formations is Late Proterozoic. The degree of metamorphism of the structures is slight. Transgressive and regressive series of sediments have been found with an age boundary corresponding to the time of accumulation of a pyrite mass. The Upper Proterozoic sandy-silty-clayey deposits of southern Novaya Zemlya correlate with similar formations on other arctic islands. Figures 3; references: 5 Russian.
[19-6508]

UDC: 551.242.31(574)

HISTORY OF DEVELOPMENT OF CENTRAL KAZAKHSTAN PALEOZOIDS

Moscow GEOTEKTONIKA in Russian No 4, Jul-Aug 84 (manuscript received 11 Dec 81)
pp 46-60

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[Abstract] A tectonic map of central Kazakhstan paleozooids is presented and interpreted. The Caledonian structural complex was formed from the late Riphean through the Silurian and consists of activated continental plates plus typical geosynclinal active ocean margin formations. The continental structural stage, island-arc structural stage and orogenic structural stage are described. The Hercynian structural complex is considered to be a result of orogenic activation of the micro-continent of Kazakhstan as it interacted with the Paleo-Thetys oceans. The complex consists of the Acadian, Saurian, Sayan, and Pfalzian Phalze structural stages. It is concluded that the geological structure of central Kazakhstan paleozooids was formed by active interaction of the pre-Late Riphean continental microplate with the Caledonian Paleo-Asiatic ocean, Hercynian ocean and Siberian continental plate. The Caledonian stage of development involved intensive destruction and orogenous activation of the pre-Late Riphean microcontinent and irreversible development of a single ocean basin. Formation and structural analysis of the Hercynian structural complex shows that there were no large geosynclinal basins at that time, the territory developing as an active continental margin. Central Kazakhstan experienced its final tectonic-magmatic activation in the Permian. Figures 3; references: 45 Russian.
[25-6508]

UDC: 551.211+551.736(470.326)

LOCATION OF CONTINENTAL PERMIAN VOLCANITES OF CENTRAL ASIA AND ITS TECTONIC
INTERPRETATION

Moscow GEOTEKTONIKA in Russian No 4, Jul-Aug 84 (manuscript received 16 Nov 82)
pp 75-89

KURCHAVOV, A. M. and YARMOLYUK, V. V., Geology of Ore Deposits, Petrography,
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[Abstract] A study is made of the general spatial distribution, structural position and composition of Permian continental volcanic formations in central Asia based on maps of the volcanites prepared by the authors. The maps also show late Carboniferous or early Triassic rock related to the Permian formations in the same series. Permian volcanites are found among places in the Balkhash area. In the central Kazakhstan volcanic zone the Permian volcanogenic series is concentrated in the Tokrausk and Northeast Balkash areas. The series lies over Devonian deposits or Upper Carboniferous-Lower Permian volcanites, differing from them in more alkaline composition of the rock. The youngest volcanogenic formations of eastern Kazakhstan, dated by organic remains, are volcanites of the lower Triassic along the left bank of the Irtysh River near the city of Semipalatinsk. This suite consists of basalts, trachybasalts and trachyandesites associated with trachyrholite varieties which predominate. In central Kazakhstan, Permian and Carboniferous volcanites are not found west of the system of fractures corresponding to the Karaganda-Balkhash west shore meridian. Figures 5; references 43: 40 Russian, 3 Western.

[25-6508]

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